Studies investigating dietary changes during fixed orthodontic treatment and food advertisement content analysis

Thesis submitted in accordance with the requirements of the University of Liverpool for the Degree of Doctor of Dental Science (Orthodontics)

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Part B – A content analysis of UK television food advertisements: A dental & orthodontic perspective

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Abstract part A

Aim:

To use a qualitative research method to investigate adolescent patient perspectives of, and actual alterations in dietary intake in relation to concurrent fixed appliance treatment, and the patients' thoughts and reasoning behind such changes. Furthermore, it aims to identify whether any initial changes are maintained following acclimatisation with appliances.

Design:

A multi-centre qualitative study utilising semi-structured interviews. Diet diaries were also used to aid data generation during interviews.

Setting:

Liverpool University Dental Hospital and Halton General Hospital, both in Merseyside, UK.

Subjects:

Nine participants (eight females and one male) aged between 11-14 years old (mean 13.3 ±1.2 years).

Methods:

A purposive sampling method was employed to recruit participants from two centres. Participants completed semi-structured interviews at two time points (T1 = six weeks into treatment, T2 = six months into treatment) to investigate developments over time. An iterative process was used, starting with a topic guide and then guided by the participants answers to focus interviews, and following data saturation, a thematic analytical process (framework analysis) was used to analyse the data with NVivo qualitative data analysis

software. Two researchers independently coded the transcripts (DP, ADH). Diet diaries were required before and after appliance placement and also at 6 months.

Results:

A total of 17 interviews were conducted with 9 participants (1 participant refused to participate in the final interview and final diet diary), and 3 main themes were identified as 1) Aetiology of changes, 2) Adaption, and 3) Behaviour. Participants changed their dietary intake with fixed appliances for 5 main reason: pain, difficulties such as food trapping, concerns such as breakages, barriers such as time, and aesthetic motivations for changes. They adapted their diets via 5 fundamental methods: physical alterations such as cutting foods up further, restrictions, substitution, temporal changes i.e. in ability, and adjunct use such as interproximal brushes. Their dietary alterations were modified by 4 primary behaviours: social behaviours, learning behaviour through trial and error, habits and rountines, and attitude towards appliance wear.

Conclusion:

In the long term, reliance on modifications and adjuncts were generally reduced and some patients were able to return to their previous dietary habits. The results have elucidated the difficulties which our patients face with fixed appliances and this knowledge could be used in formal orthodontic training programmes and also to both motivate and educate patients using a more precise prediction of what they will experience, therefore facilitating the informed consent process. Such information also has implications for the dietary health of patients, their clinical management (such as reducing breakages), and therefore the cost of treatments.

Abstract part B

Background:

Despite regulations designed to limit the advertising of foods and beverages high in fats, salt &/or sugars (HFSS) to children on television in the UK, there is evidence to suggest that children are still exposed to a considerable volume of such advertising, particularly during family programming where the regulations often do not apply.

Aim:

To investigate the prevalence and nature of food & beverage (denoted as food from this point) advertising shown on UK television during peak family viewing programming and therefore viewed by children & adolescents, with specific regard to foods potentially detrimental to dental health and fixed orthodontic appliances.

Design:

Content analysis of televised advertisements in the UK.

Setting:

Broadcast of national channels shown in the North-West region (Merseyside), England, United Kingdom.

Methods:

Recordings were made from the main commercial UK channels- ITV1, Channel 4 and E4, from consecutive Friday & Saturday evenings (from 6pm to 9pm) over a four-week period during January & February 2017.

All advertising (food and non-food) was coded according to pre-defined criteria, adapted from a scheme previously used by Boyland et al (2011). Food advertisements were coded for programme category, channel, food type, health claims, primary target, cariogenic, acidogenic, anti-cariogenic/anti-erosive effect, and mechanical detriment to appliances/hardness. Foods were also classified as core (healthy)/ non-core (unhealthy)/miscellaneous foods.

Results:

Out of 709 advertisements assessed, 20% were for food products and only 20% of food advertisements promoted core food products. Of the food advertisements, 62% promoted products considered harmful to dental health and 64% were detrimental to orthodontic patients, due to being deemed cariogenic and/or acidogenic, as well as being items considered mechanically detrimental to fixed appliances.

E4 viewers were 2.3 times more likely to be exposed to food advertisements (OR 2.29 95% CI; 1.15-4.56, p=0.018), and 10 times more likely to be exposed to advertisements for dentally harmful items (OR 9.38 95% CI; 2.35-37.40, p=0.001), compared with Channel 4 viewers.

A majority (87%) of food advertisements that made health claims were promoting products harmful to dental health and such advertisements were over five times more likely to be for foods that are harmful to dental health (OR 5.26 95% CI; 1.73-16.06, p=0.004).

Conclusion:

The majority of televised food promotions appearing in and around family programmes very popular with children in the UK are for products detrimental to dental health and fixed appliance wear. The proportion of food advertisements detrimental to dental health differed significantly between channels, programme categories, and between those advertisements with health claims and those without.

This has implications for patient education with regard to negative media influences, and results suggest that further regulation of food advertising in the UK is needed to reduce the public exposure (especially children) to HFSS food advertising on television during peak family viewing times. Attempts to combat the consumption of HFSS foods will improve not only general health but also dental health, particularly for orthodontic patients.

Introduction

When patients are provided with fixed orthodontic appliances, dietary advice is also given by the orthodontist. Diet modification is a very important aspect of treatment as a poor diet can lead to many negative sequelae, such as demineralisation, carious lesions, and prolonged treatment times (due to breakages).[1] In addition, patients are also likely to alter their diet due to discomfort or physical impairment of mastication.[2]

Patients undergoing fixed appliances will be required to change their diet to facilitate treatment, and need to be made aware of this prior to starting, and during therapy. If successful, such alterations may lead to a decreased frequency of failed brackets, reduced iatrogenic damage and an expeditious treatment duration. It is important to investigate this topic as there are cost implications to the NHS, as well as health implications to the patient, if patients fail to adjust their diet and damage their appliance.

Many previous studies have demonstrated an altered dietary intake associated with fixed appliances, [3–5] but it is not clear how patients feel their diet has changed and do such changes continue throughout their treatment or do they adapt their functional habits to maintain their original diet?

Another factor strongly implicated in dietary choice, particularly among young people, is television food advertising. Previous studies have shown that children, particularly boys, increase their sugary intake after exposure to television advertisements for foods with a high sugar content.[6]

In 2007 the Office of Communications (OfCom) introduced a phased change to the regulations regarding food advertising on television, in an attempt to reduce the amount of exposure children have to advertisements for foods high in fat, sugar and/or salt (HFSS).[7] Despite changes in regulations of television food advertising during peak children's airtime, they are still exposed to many advertisements for HFSS during 'family' viewing times.[8]

To investigate these two aspects of dietary influence, this study was divided into two parts. Part A investigated dietary alterations before and after fixed appliance therapy using a qualitative methodology. Part B examined the types of television advertising children are likely to be exposed to, with a specific focus on core/non-core foods, health claims made, the primary target of the advertisement with regards to age, cariogenic potential, acidogenic foods, foods with potential anti-cariogenic and/or anti-erosive effects, and mechanical detriment to orthodontic appliances.

Part A

How do fixed appliances change patients' diets and why? A longitudinal multi-centre qualitative study

Chapter 1: Literature review

1.1 Background

Fixed orthodontic treatment has been associated with many side effects, which can alter the patient's diet such as pain and soreness, ulceration, and reduced quality of life.[2,9–15] It is important that orthodontic practitioners are aware of such effects and the experiences that patients will go through. This will help to provide realistic advice following fixed orthodontic care and to fully inform patients for consent to treat.

A few qualitative studies investigating this topic have concluded that patients had difficulties eating after orthodontic appliances were fitted, which led to a heathier diet. For example, patients ate a softer diet including pasta, rice, bananas, soups, boiled vegetables and milk. They also avoided sugary snacks and fizzy drinks on the advice of their orthodontist.[1,16] However, unlike previous reports this study aimed to ascertain whether the initial changes in dietary intake are maintained over time.

Research has shown that patients and parents did not expect the amount of pain and reduced masticatory function associated with orthodontic treatment. However, children appear to have a greater expectation of the reduction of food types they can consume, compared with their

parents. This may also be affected by ethnicity, as non-white groups may better anticipate dietary restrictions. [17]

1.2 Dietary changes

Fixed as well as functional appliances have been shown to produce significantly more pain and discomfort when compared with removable appliances, and there is a gradual adaption to pain from 3 to 14 days.[10,11] The amount of initial pain and discomfort experienced is also a predictive factor for appliance/treatment acceptance.

The mastication of hard foods is difficult for patients wearing fixed appliances due to pressure, sensitivity, pain and discomfort.[10] However, patients are also advised to avoid hard foods to avert damage to the appliance and may therefore avoid such foods even if pain is no longer present. Patients may also find that they are functionally unable to masticate the same diet as pre-appliance application due to sensitivity, pressure changes and mobility.

Periodic changes in diet are likely to occur during fixed treatment as initial pain and discomfort from the teeth and mastication will reduce after the first week of appliance therapy.[2,9,10,12,18,19] For the reasons above, patients who are treated with fixed appliances will experience an alteration in dietary intake.

1.3 Insufficiencies

Dietary insufficiencies related to fixed orthodontic treatment have been associated with many detrimental effects on health. A decreased intake of manganese and copper has been reported,

which can affect the rate of orthodontic movement.[3] Up to 72% of orthodontic patients may have suboptimal levels of ascorbic acid affecting the periodontal ligament connective tissue and osteoid formation.[20,21] Dietary insufficiencies can also result in an altered gingival response due to irritation from bands and brackets.[22] Compared with control groups, orthodontic groups may have a reduced intake of fibre, chromium (involved in insulin secretion) and beta-carotene (free radical reduction), and a significantly higher intake of saturated, monosaturated and polysaturated fat and cholesterol.[4]

There are conflicting reports in the literature with regards to the effect of orthodontic appliances on macro-nutrient intake.[2,4] Any reduction in dietary carbohydrates, proteins and fats associated with fixed orthodontics will initially lead to reduced weight, muscle mass and fat stores.[2,23]

Given the increased nutritional demand in the adolescent period of rapid growth, some authors have stressed the need for targeted dietary advice in this cohort.[3,4] This sentiment is echoed in reports that suggest that adolescents frequently suffer poor dietary behaviour.[22] There are many sources of dietary advice which clinicians can consult to educate their patients, including advice from the British Society of Orthodontics.[24,25]

In some cases patients have reported an improvement in diet with orthodontic treatment, for example reducing sticky/hard foods [2] and avoiding sugary snacks and fizzy drinks.[16] However, masticatory pain can also lead to avoidance of healthy foods such as raw vegetables, meats, fresh fruit and bread.[4] Body mass index (BMI) status is an important predictor for dietary change, as overweight patients experience a larger impact on dietary behaviour and the greatest reduction in fat percentage.[2]

1.4 Timing of dietary changes in relation to treatment

A questionnaire study by Mandall et al suggests that the dietary impact of fixed appliances remains constant over time and that an adaption phase should not be expected following initial difficulties.[5] However, a prospective cohort study investigating 124 participants aged 11-14 years old found that the impact of orthodontic treatment on diet was significantly higher at six weeks compared with three months post-fixation.[2] For this reason, the second semi-structured interviews in this study were conducted at six months post fixed appliance placement, in order to allow all participants the chance to adapt to these new conditions if applicable.

To our knowledge no other study has used a qualitative design to investigate periodic changes in diet over time, as well as the initial changes encountered. One hypothesis was that orthodontic patients with fixed appliances will adapt over the early treatment period, to retain their original dietary intake.

1.5 Diet diaries

In general dental practice, the use of diet diaries is greater in paediatric cohorts and they are more likely to be utilised by older practitioners delivering private dental care.[26] Financial pressures and time constraints are the most likely reason why as little as 28% of general dental practitioners are involved in their use. Less attention tends to be given to the amount of sugar in the diet, and more on specific advice such as the timing of sugar attacks and harmful items.[27]

Several studies have investigated the worthiness of diet diaries to record patients' dietary intake.[26–29] One cross-sectional study compared four dietary assessment methods on socio-economically deprived households in London, which were the *Repeat 24-hour recall method, the Food Checklist method, Semi-weighted method* and the *Weighted Inventory* method.[29]

The *repeat 24-hour recall* method uses four 24-hour recalls that are non-consecutive and include at least one day at the weekend. In the *Food checklist* method participants are given four pre-printed lists of foods and are required to tick off the food items when eaten. Portion sizes are also recorded.[29]

In the *Semi-weighted* and *Weighted inventory* methods, all of the household members have to record everything that they eat or drink over four consecutive days and the total weight of the food shared at home is calculated using digital scales. The distribution of food to members of the household is reported. This method is difficult to complete, mainly due to difficulties with compliance from all household members.[29]

The *24-hour recall* method was preferred by the researchers, however respondents preferred the *Food checklist* method. Both methods were found to provide a superior estimation of energy and nutrients in the diet compared with the *Semi-weighted* method. The study concluded that four multiple-pass 24-hour recalls were the preferred method of dietary assessment.[29]

One of the major limitation of diet diaries is compliance. In a teaching hospital setting, respondent rate was found to be lower than 35% and is biased towards regular brushers and smaller families.[28] In addition, any missing data can reduce the validity of this method as a

dietary assessment tool as children have a reduced cognitive ability to remember what they have eaten.[30] However, content analysis of diaries always allowed the clinician to find harmful foods.

Chapter 2: Aims & objectives

2.1 Aims of study

This study aims to investigate qualitatively how patients' dietary intake changes with fixed appliance therapy and the reasons behind these changes. Furthermore, it is envisaged that it will be possible to identify whether any initial changes are maintained following acclimatisation with fixed appliances. Semi-structured interviews will be used to assess patient perceptions of any eating difficulties.

2.2 Objectives of study

- Assess patients' perceptions of how dietary habits are modified initially
- Assess patients' perceptions of how dietary habits are modified in the long-term
- Identify key factors/themes involved in any dietary alterations associated with fixed appliance wear

Chapter 3: Methodological framework

3.1 Research design

Semi-structured one-to-one interviews were used in a private non-clinical setting. New data were used to guide further interviews until saturation was reached and no further themes emerged. No time limit was placed on the interviews, and they were audio recorded and transcribed verbatim ready for analysis.

Semi-structured interviews allowed for follow up on the points raised by answers. They allowed the interviewee to lead the data acquisition, whilst also having some structure to guide the interview. A key topic guide (appendix 1) was used to give direction to the interviews and allow exploration of ideas and themes.

To minimise bias, all assumptions of the researcher were set aside (bracketing), e.g. "…following a 'bedding in' period patients will return to their previous dietary habits…". In addition, a research diary was kept to record notes to aid reflexivity, as well as emerging impressions and thoughts. This was used to aid impartiality and understand the bidirectional effect the researcher might have on the research findings. A second investigator (ADH) independently coded and generated themes to further reduce bias.

3.2 Research population

A purposive sampling method was employed to select patients who are due to receive a fixed appliance from the orthodontic department at Liverpool University Dental Hospital, which is part of an inner-city hospital hub. The second site, Halton General Hospital, was a smaller

district general hospital. This method recruited patients of different genders, ages and ethnicities, who had experience of the treatment modality of interest.

3.3 Criteria

Inclusion criteria

Patients were invited to participate in the study if they were between 11-14 years old, medically fit and well, and if both arches received fixed appliances.

Exclusion criteria

Patients were excluded if: they had a medical condition which alters dietary intake (such as diabetes), an interpreter was needed, they were undergoing orthognathic surgery or adjunctive removable appliances, or if they were fasting.

Withdrawal criteria

If participants wished to leave the study early then data they had provided in the questionnaire, diet diaries and any interviews were used to evaluate any changes up until the point of exit (anonymised). However, if the participant did not complete the second interview and diet diary then it was not be possible to evaluate any adaption to fixed appliances over time in such patients and were excluded. Therefore, only completed data from participants who had completed both interviews and diet diaries were used for analysis of long-term changes.

If participants wished to withdraw their consent, then all of their data would be destroyed, and participants were reminded that a refusal would not have affected their treatment in any way.

3.4 Sampling procedure

A purposive sampling method was employed to recruit patients to the study who met the inclusion/exclusion criteria. Allocation, concealment, randomisation and blinding were not required as this was a qualitative study. Participants were recruited from the list of new patients seen by the first year orthodontic registrars at Liverpool University Dental Hospital and Halton General Hospital orthodontic departments.

After new patient assessments, when patients were to receive fixed appliances (braces), at the following appointment for treatment planning the patient and parent/career were given an explanation of the study, an information pack and the opportunity to ask questions of the researcher. The patient was not asked to make a decision on study participation (and to hand in the signed consent form if appropriate) until the next appointment for fixed appliance placement (usually between two to eight weeks later), in order to allow a reflection period. Initially, 10 participants were to be recruited and if data saturation was not achieved then further patients would have been approached.

3.5 Sample Size

The total number of participants needed became apparent though data saturation, however a similar previous study by Al Jawed et al was used as a guide, and found saturation with 10 participants following a pilot study with four participants.[16]

3.6 Study Design

Recruited participants entered the subject pathway shown in figure 1. Subjects were given a diet diary (appendix 2) to complete at the treatment planning appointment to submit with their consent form, at the fixed appliance bond up appointment. At the subsequent appointment for fixed appliance bond-up, another diet diary was given, and collected at the six-week review appointment. Participants were instructed to complete the diary the week before this appointment and a reminder (including a copy of the diary) was also posted closer to the review appointment, and if appropriate, the participant was contacted by phone to improve compliance.

The first semi-structured interview was arranged to coincide with the first six-week review appointment (T1). This interview considered the changes in diet since the patient received fixed appliances. The diet diaries were used to aid discussion and generation of new themes / information during the interviews. Another was given at this appointment; however, the subject was asked to complete it the week before the second semi-structured interview at the six-month period (T2). Again a reminder (with a diary copy) was posted closer to the review date, and/or the participant contacted via telephone.

A second semi-structured interview took place at six-months post bond-up and coincided with a review appointment. This interview investigated how the patient's diet had changed since any initial changes. All three diet diaries were compared and used to aid the interview process again. All data was then collected and analysed with the thematic method.

Following transcription, the raw data were analysed utilising a Framework method, a type of thematic analysis [31]. An iterative process was used and themes generated with unrestricted coding, which was then refined. Two researchers (DP, ADH) independently coded the transcripts.

Codes were then grouped together into categories and following initial transcript analysis, a set of codes were agreed and applied to subsequent transcripts. These categories and codes were then used to index the remaining transcripts. NVivo qualitative data analysis software (QSR International Pty Ltd, Melbourne, Australia, version 12, 2018) was used to analyse the transcribed data.

A six question questionnaire was also submitted with the first diet diary, which asked the participant to describe their television viewing habits and links to part B of the study which investigated the influences of televised advertising on diet (appendix 3). Participants were asked about their television viewing habits in terms of duration on week/weekend days, whether they watch television with meals, whether they have a television in their room, and which 3 channels they watched the most. This information was collected to demonstrate the likely exposure of children in this age group to the advertisements investigated.

3.7 Interventions

No interventions were used in this observational qualitative study, however it was designed around an existing real world intervention of fixed orthodontic appliance treatment.

3.8 Study flowchart

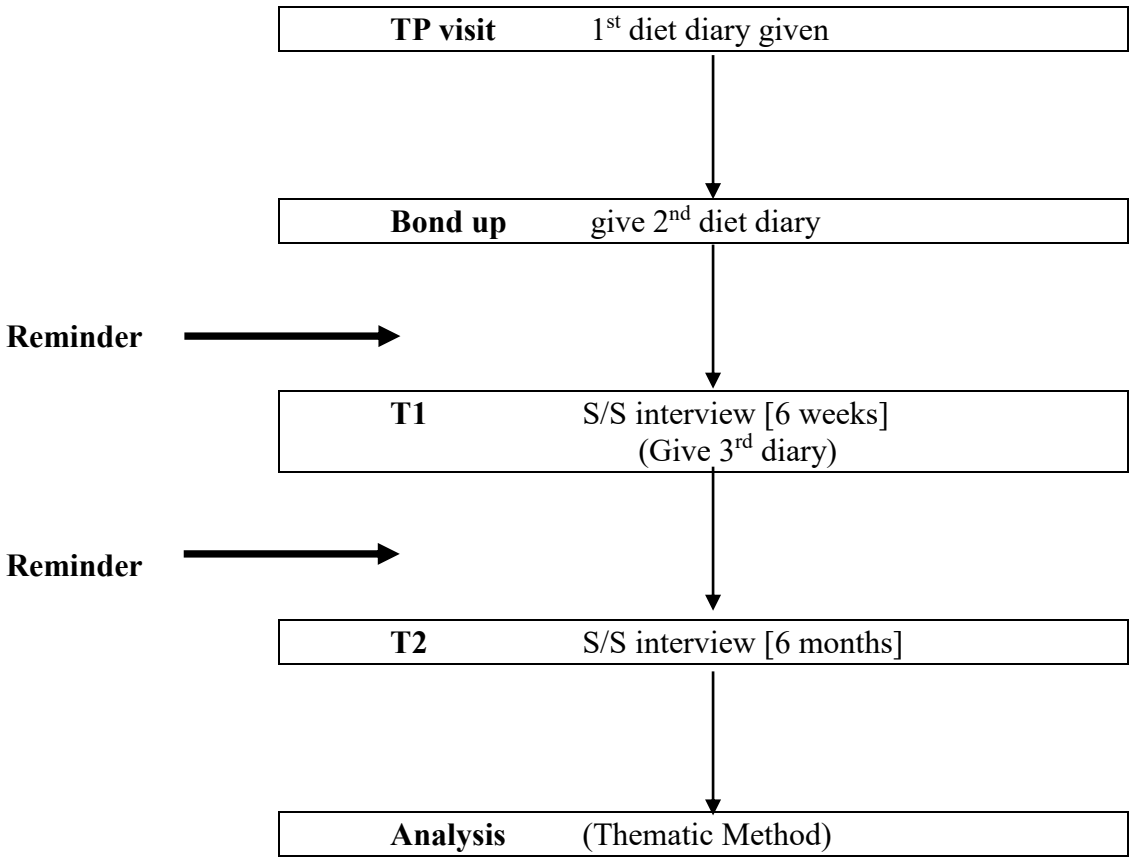


Figure 1- Subject pathway

3.9 End of study

Participants were asked to complete one questionnaire and a diet diary in the initial stage and then continued their study involvement with two further diet diaries and two interviews, one diary/interview after approximately six weeks (T1) and one diary/interview after approximately six months (T2). Following the second interview the participant had completed their study involvement.

As this project had a qualitative semi-structured interview design, data collection was concluded once data saturation from the T2 (six month) interviews had been achieved.

3.10 Statistical Considerations

The mean age, with standard deviation, of participants was calculated. For analysis of the diet diaries, descriptive statistics was used to evaluate any changes in the frequency of cariogenic foods/beverages, acidogenic foods/beverages and the frequency of foods mechanically detrimental to fixed orthodontic appliances. Although a quantitative method was applied to evaluate the diet diaries, a mixed-methods methodology was not used as the diaries were only used to aid interview data collection and the results presented for interest only.

3.11 Consent

All study participants and their parents were provided with an information sheet (appendix 4) and were required to sign a consent form (appendix 5) at the next appointment; parents were asked to sign a ‘parental consent form’ and children were asked to sign a ‘child assent form’.

Consent to enter the study was sought from each participant only after a full explanation was given, an information leaflet offered and time allowed for consideration. Signed participant consent was then obtained. The right of the participant to refuse to participate without giving reasons was respected. All participants were free to withdraw at any time from the study, without giving reasons and without prejudicing further treatment.

Informed consent was conducted by the student researcher (DP), or the clinician involved in the patient's care (orthodontics registrars and later confirmed with the participant and their carer by DP). However, following initial consent gathering, the treating clinician had no further part in this study. Consent to audio recording for verbatim transcription was also confirmed verbally at the start of every interview.

Loss of capacity during the study

If any participants lost capacity during the study, then they would have been withdrawn along with any of their identifiable data.

3.12 Ethical issues

As this project involved human participants, who were treated under the National Health Service, ethical approval was sort through the Integrated Research Application System (IRAS) and included application to the National Research Ethics Service. No interventions were conducted on patients as this was a purely observational study.

The study was submitted to each proposed research site for Confirmation of Capacity and Capability, and was conducted in accordance with the recommendations for physicians involved in research on human subjects adopted by the 18th World Medical Assembly, Helsinki 1964 and later revisions.[32]

3.13 Collection and confidential handling of data

All information/data was stored on a password protected computer in the student researcher's (DP) office, which required pin code entry. All manual files and recording equipment/data were also be kept in this office and locked away.

Anonymisation

Participants were assigned a number based on the order in which they entered the study e.g. the first participant was coded as participant 01, the second as 02 etc. The participants could not be blinded from the research team and all data were kept confidential.

3.14 Study management

The day-to-day management of the study was coordinated by the student researcher (DP) in the orthodontic department at the University of Liverpool.

Indemnity

The University of Liverpool held Indemnity and insurance cover, which applied to this study.

Sponsor

The University of Liverpool acted as Sponsor for this study. It is recognised that as an employee of the University the Chief Investigator had been delegated specific duties, as detailed in the Sponsorship Approval letter.

Funding

This study was funded by the University of Liverpool, as part of a Doctorate of Dental Science (DDSc) in orthodontics.

Risks and Burdens

Participants were not subject to any experimental intervention however, during interviews they were at risk of becoming distressed while talking about potentially painful/upsetting experiences of acclimatising to orthodontic appliances (braces). To minimise this risk, interviews took place in a private setting and were conducted in a friendly and informal manner, and with empathy toward the patient's experiences.

Discussions regarding diet modification could have potentially led to unexpected disclosure of an eating disorder such as Anorexia nervosa, Bulimia nervosa, Binge Eating Disorder or Eating Disorder Not Otherwise Specified (EDNOS). This scenario was very unlikely as patient history and examination should have identified any disorders during the treatment planning stages of treatment. In cases of disclosure, patients would have been offered information/support, a referral to a general medical practitioner/psychiatric care, as well as a dental practitioner for any immediate care needed.

Chapter 4: Results

A total of 9 participants were recruited into the study from the 2 centres (5 from Halton General Hospital & 4 from Liverpool University Dental Hospital). The sample consisted of 8 females and one male, with an age range of 11.8 to 14.8 years old (table 4.1), with a mean age of 13.3 years (SD ±1.20). The sample consisted of mostly white Caucasian participants, with one Asian participant.

Figure 4.1 demonstrates the flow of participants throughout the study, and reveals that 2 potential participants refused to participate, and that 3 participants who were recruited then declined to be interviewed and were therefore regarded as 'dropouts'. An initial round of 9 interviews were therefore conducted at T1, with 1 participant refusing a second interview and dropping out. This resulted in 8 interviews being conducted at T2, giving a total of 17 interviews in total. To encourage participant validation of data collected, each interview was concluded with a summary of the topics/issues discussed and the participant given the chance to feedback on the results.

Interviews were transcribed verbatim, and reviewed as part of an iterative process with the use of a research diary, in order to modify the topic guide as appropriate. Interviews were independently coded and themes generated by 2 investigators (DP and ADH) to reduce bias. Initially the process involved a manual review of the transcripts for early interpretations, followed by a second review of the coding on computer-assisted qualitative data analysis software or CAQDAS (NVivo - QSR International Pty Ltd, Melbourne, Australia, version 12 for Mac, 2018), using framework analysis (see appendix 6 for an abridged version).

MS Excel (Microsoft Corp, Redmond, Washington, USA, Excel for Mac 2016) was also used to generate and categorise emerging themes by clustering related initial codes and cross-referencing codes created. This allowed for initial conceptual framework construction, which eventually resulted in 3 interconnected main themes: 1) Aetiology of change, 2) Adaption and 3) Behaviour.

Participant	Age	Gender	Ethnicity
1	13.7	F	White Caucasian
2	14.4	F	White Caucasian
3	12.8	M	White Caucasian
4	12.7	F	White Caucasian
5	13.9	F	White Caucasian
6	11.8	F	White Caucasian
7	14.8	F	White Caucasian
8	11.3	F	Asian (Indian)
9	14.0	F	White Caucasian

Table 4.1 Study participant demographics

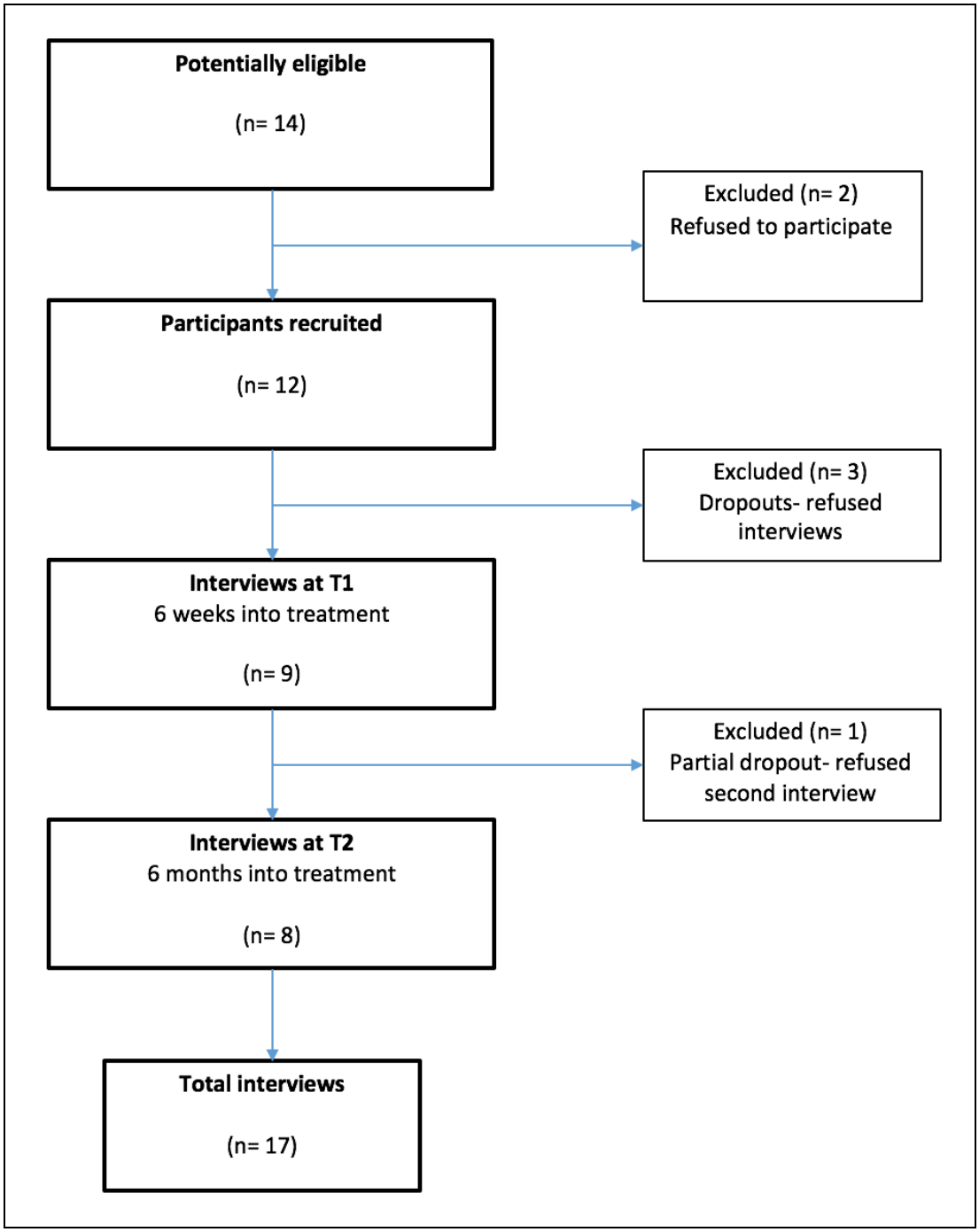


Figure 4.1: Study participant flowchart

4.1 Theme 1: Aetiology of changes - Why do patients change their diet?

Over the course of the 17 interviews a very common theme identified was the aetiology of dietary alterations. Participants described factors such as pain, difficulties with eating, concerns such as breaking the appliances, barriers to maintaining their usual diet, and aesthetic motivations for changes (figure 4.2).

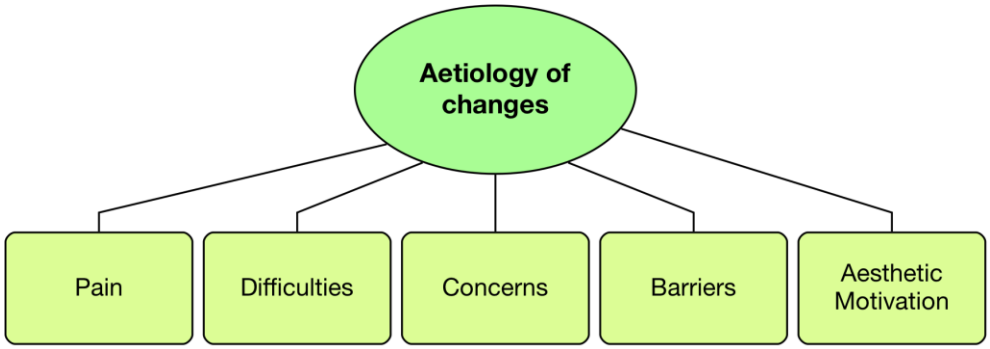


Figure 4.2: Theme 1: **Aetiology of changes** and subthemes

4.1.1 Pain

Participants reported experiencing tenderness and pain with hard foods and this caused them to avoid these items and substitute them for softer foods. This was a frustrating and upsetting event for them.

"Like everything, you couldn't bite into nothing. Everything was like dead tender and that. So [I] just ate like soft stuff... Like your whole mouth was just hurting and I just wanted to pull the brace off." (P7 T1)

The duration of pain/soreness after appliance adjustments ranged from 1-2 days to 1-2 weeks and pain was also experienced with breakages. However, the duration of soreness appeared to reduce with time spent in appliances.

"Yeah I'm a lot more conscious of breaking it coz it's happened so many times and sometimes it hurts when it pops off so I try not to break it" (P2 T2)

"As they get like a bit tighter obviously it hurts a little bit more but for less time, only for like a few hours and then it'll be fine" (P9 T2).

During the interviews the participants described the types of sensations they had experienced, which included a 'movement' feeling, whereby the patient felt like they could sense the actual movement of the teeth caused by the appliance. They also experienced feeling their teeth would fall out, bruising and irritation of the mucosa.

"It feels like, I think it feels like my teeth are gonna like fall out and they ache, I can't describe it… If you bite down it's like pushing them, you feel like they're actually loose in your mouth" (P5 T2)

"It just feels like you've got little bruises kind of like on your teeth" (P9 T2)

"I've been getting like pain like in my gums like obviously when the teeth are moving and then it's been like rubbing against the inside of my mouth" (P6 T2)

Many participants stated that the pain they experienced was worse on the front teeth and that they would preferentially masticate on the posterior teeth.

"It would really hurt. Especially on the front 2 teeth. They're the worst" (P6 T2)

In some cases, participants had tried to gauge the hardness of their food, or the difficulty they would experience with eating the item by tentative trial and error.

"It's a lot, lot more achy so like hurts to bite on it and I don't really want any more pains so I have like softer food that I can eat, just put [food] in and swallow or put [food] in and I know it's not going to hurt coz I'm not biting dead hard" (P1 T1).

The duration of meals was extended by fixed appliance and this was in part due to soreness.

"… obviously they hurt yeah, yeah it would take me longer to eat things coz it would hurt a lot more so I'd be like eating smaller amounts at a time" (P5 T1).

4.1.2 Difficulties

Participants expressed many difficulties eating with fixed appliances, the most common of which was food trapping with foods such as chocolate, crisps, and cheese etc. This phenomenon caused the patient to carefully consider the foods that they ate and how they would remove debris, which was commonly by washing out with water in the first instance and using their tongue. They also used tooth brushing and interproximal brushes.

This also affected the times of day the participant ate, as towards the end of the school day some said they would wait until they got home to eat, where they knew there would be water to rinse with. They also cited the extra effort required to clean after eating as a reason to avoid certain foods.

"Coz it gets trapped and I just can't be bothered getting it out, so I just have food that I know that probably won't get stuck so that I won't have to wash it straight away so I don't" (P1 T1).

"…I'd say like quite often like there's always a bit of something [trapped], yeah" (P5 T1).

The physical characteristics of the appliances also led to eating difficulties, such as thin archwires being pulled out, the size of the tooth surface available for mastication (reduced with small teeth and large brackets), and any broken braces themselves interfering with chewing.

"If the wire is not cut long enough and the brackets have actually got holes in my gums and then cheeks where it just digs in (P7 T1)*… I've already got small teeth and then the bracket takes up like all my teeth so I've got nothing to physically bite into the apple with so I just have to cut it up"* (P7 T2).

"I chew normally but sometimes when one of my braces come out it's a bit hard to chew coz of the wire" (P8 T2).

Participants who had to undergo additional interventions also reported difficulties with eating. This included quadhelices, occlusions opened with Glass Ionomer Cement (GIC), and participants who had extractions undertaken as part of their orthodontic treatment. Extraction spaces led to wide spaces with thin wires that were fragile and could be bent, lost, or snapped.

"Whenever I eat like, my mouth doesn't close as much anymore [after bite opening], so like I don't, I feel like the crumbs go everywhere! Coz my mouth is more open…" (P9 T1)

"Well yeah coz on the paper that you get given it said eat on the side where your tooth wasn't taken out but it was one from each side so I ate pasta for like a full week" (P2 T2).

"I had to get a tooth taken out… so I have to eat on my other side but then I have to eat on my other side as well coz obviously that one will just break away or something coz I'm using

that one too much… Yeah coz that tooth had been taken out so it's just a wire there so if it just bends or anything it can just snap or come out of place" (P4 T2).

Other difficulties with eating included rubbing, cuts in the front of the mouth, inability to eat on one side after adjustments, forks getting suck in the brace, ulcers, a metallic taste, and even choking,

"[Worries about] Getting food stuck coz I couldn't get it out because the jelly sweet I nearly choked on got stuck at the back so I had to get it out, I couldn't do anything about it" (P2 T1).

4.1.3 Concerns

The most common concern expressed by participants was breakages of the appliance. Even participants who claimed to have very little, if any dietary changes, admitted to worries over breakages.

"Like I don't want the brace to kinda break or anything because it has broken like chewing on, not on hard stuff, like a sandwich but if it was a hard thing I wouldn't bite on it coz I'm scared it can break and that" (P9 T1).

The participants were worried about parental reprisals for breaking the appliance, as they were aware this would mean an extra appointment at the hospital, with extra cost/disruption to the parent, disapproval from the orthodontist and a longer treatment duration.

"Yeh I just had the pen in me mouth and then it just fell off and oh god, the whole brace just like started sliding out and I was like me mum's going to kill me!" (P7 T1)

Participants were also fearful of having the appliances taken away from them due to repeated breakages.

"Coz like I don't want to like snap it coz like if you snap it too many times they will just take it off coz they know you can't take care of it. So I have to be like very careful coz I want to keep them on obviously so I get straight teeth and everything, but yeh" (P4 T1).

4.1.4 Barriers

Participants found that time was a barrier to looking after their appliance, especially in school, where there was reduced time for cleaning and to remove pieces of trapped food.

"You don't really have time to brush your teeth at school so it's a bit like ewww" (P9 T2).

"In the morning do you know coz like you are in a rush to get ready, I don't find that I brush me teeth as well as I could have" (P1 T1).

In order to maintain their usual diet including hard foods, participants felt they needed time in order to adapt their eating methods, such as greater fragmentation of foods and taking time to eat. However, as this time was often not available, this became a barrier to maintaining the same diet.

"I just haven't had the time to chop it up" (P5 T1).

The logistics of looking after appliances, such as locations to clean, were also a barrier, and there was a social stigma to cleaning at school in front of peers.

"There is nowhere that you can do that though in school. We have like the toilets but it's a bit weird to, coz It's like not drinking water if you know what I mean, so you can't put that in

your mouth and there is no other places in there that you can go to wash your mouth out" (P1 T1).

4.1.5 Aesthetic Motivation

One of the reasons for dietary changes stated by several participants was an aesthetic drive for treatment and therefore a reason to make dietary alterations. This included both a desire for the final result to be aesthetic and also the avoidance of foods/drinks that would cause un-aesthetic lesions of demineralisation on labial surfaces.

"I want to keep them on obviously so I get straight teeth and everything" (P4 T1).

"I try not to have sugary drinks, coz I don't want stains and that around the erm brackets, like get little squares" (P9 T1).

"Yeah because she showed me a picture of someone who was having juice all the time and it stained their teeth so that's taught me not to" (P6 T1).

Some participants felt that they had been given a 'chance' and that orthodontic treatment was an 'opportunity' to achieve the greatest aesthetics possible and they were willing to modify their diet as necessary.

"Yeh coz the only reason I have kinda stopped having as much as I used to is coz I want to make sure I look after me teeth, I used to, I like was scared of what people think of my teeth so I wanna like make them as good as I can while I have got the opportunity" (P1 T1).

4.2 Theme 2: Adaption – How do patients change their diet?

As well as the reasons for changes to their diets, participants also discussed how they had modified their diets. This theme was broken down into 5 subthemes (figure 4.3), and included physical alterations, restriction, substitution, temporal change and adjuncts.

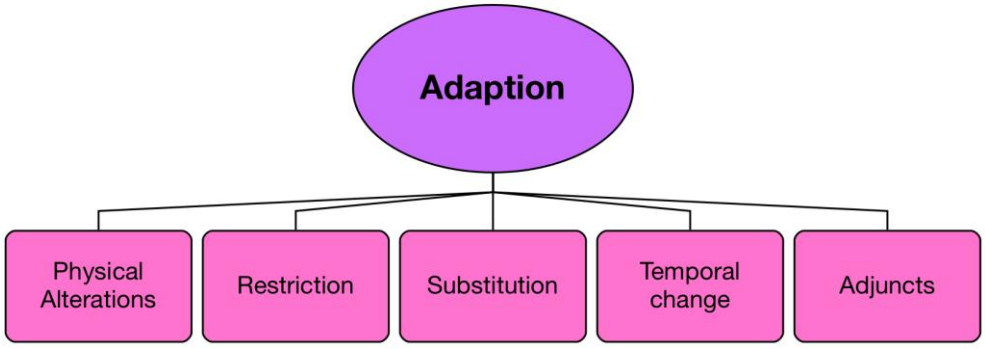


Figure 4.3: Theme 2: **Adaption** and subthemes

4.2.1 Physical Alteration

Participants in this study stated that the duration of meals was increased as they ate food more slowly compared with before they had braces. They also adapted to eating with fixed appliances by cutting up food into smaller pieces or pre-sliced food, and even smaller versions e.g. smaller apples. One participant even reported eating steak if her father had sliced it thinly enough.

"I feel I need a little more time to eat… Teeth wise, I used to like eat a lot more but because I am eating slower, I'm full… Like making them small, eating small bits at a time. If I ate cucumber, I would have to cut it up into small pieces like swallow it" (P2 T1).

"When you get them tightened it takes me like an hour just to eat a packet of crisps or something" (P4 T2).

The participants reported a reduced amount of food consumed overall and because they took longer to eat, they felt full, which may have also caused a reduction in the volume of food eaten.

"I'd say I eat less than I did erm but I still have, I say I eat less with the brace than I did without it" (P1 T1).

Participants also altered their diet by eating foods which were physically softer than previously. This was said to aid the mastication process and reduce the risk of breakages. This line of questioning highlighted foods that were surprisingly hard for participants to eat, such as grapes.

"You've gotta eat like soft food like soup and all that… I like had something like pasta for dinner like something soft" (P3 T2).

"Yeh yogurts are fine because you can swallow yogurt and that, fruits ok, grapes at first they are a bit hard like to eat unless you cut them obviously" (P4 T1).

Generally, the back of the mouth was stated as the ideal place to masticate their food and this was due to a desire to avoid pressure on the anterior teeth.

"I'm just like trying to eat with my back teeth and not put any pressure on my front teeth" (P2 T2).

"No coz if you chew it on the back teeth it like more or less like goes on your gums as well" (P4 T1).

Alternative eating methods were developed by participants, such as altering the temperature of food with a fridge or soaking food, which made it more amenable to eat. Some also reported 'chewing with their tongue'. Other methods included the use of cutlery on 'finger food' and ripping up foods such as bread.

"I normally put them in the fridge so it's not like gooey so you can just snap it off and eat it that way" (P2 T1).

"Yeah, I soak them in milk first and then eat them and they go soggy" (P6 T1).

"I'd still order a burger but I'd like cut it open like, eat it with my knife and fork rather than like pick it up and bite it" (P9 T1).

"I have crisps but I have like the skips coz you don't have to chew them they just dissolve on your tongue" (P1 T1).

4.2.2 Restriction

All participants modified their dietary intake by avoiding certain foods. Common examples were pizza bases, apples, crusty bread, nuts, hard cheeses, chocolate, crisps, sweets, and hard vegetables. The most common reasons for alterations were food trapping and risk of breakage.

"Just don't eat anything like sticky or like apples that you have to bite into coz they can fall off [brackets]…"I've kind of cut some foods out that I can't eat anymore because they just like…. They just get stuck" (P2 T2).

Surprisingly, cucumber was frequently mentioned by participants in regard to its hard nature and difficulty to eat with a brace.

"No, cucumber I can't eat anymore" (P2 T1).

"Erm just like hard foods, just like I dunno, erm just like cucumber or something like that" (P5 T1).

In many case, avoidance was only required after adjustments of appliances.

"Yeah, well it depends if I've just got it tightened then I'll be like oh I don't wanna eat like something that will hurt it, so like softer things, but not when it's like between like now I'll just eat anything" (P5 T2).

4.2.3 Substitution

The interviews highlighted a number of adjustments and substitutions that were made by participants, instead of outright restrictions. For example, participants reported boiling vegetables such as potatoes for longer, mashing food and choosing softer versions of food such as different types of crisps.

"Yeah like I don't really have like potatoes on my Sunday dinner anymore but have mash instead so it's easier for me then" (P6 T2).

"If I have crisps I can only have Wotsits because I can suck them then" (P6 T1).

"But I can't eat it proper like, I can't eat the carrot I have to boil it" (P8 T2).

Substitutions had to be made in order for participants to get a varied diet, including sources of vitamins, such as substituting oranges for apples (which were very difficult to eat). Such changes were also made in the social context, where the participant could not eat the same foods as their family at home or friends at school.

"Yeah like when I first had them on if my mum and dad were having something like I don't know like, something hard, I'd have like some vegetables which are quite hard I'd have them

really soft or beans instead which were easier to eat and I take like an orange to school like every day and I used to take like an apple or an orange or banana sometimes but it's a bit of a faff to eat an apple in school" (P9 T2).

4.2.4 Temporal Change

Between the T1 and T2 interviews, participants often reported that they got used to their appliances and that they could consume an increased range of foods, and not just softer foods. Generally, participants found that their situation changed over time and this was related to fixed appliance adjustments, whereby initially they were limited to soft foods (a popular choice was noodles), which became less necessary in the long term. Participants became more comfortable with the appliance and the painful period after adjustments appeared to reduce with time.

"I can bite into food but it depends on like how soon after I've had my braces fixed coz it's painful sometimes… Because in the first week it hurts so I couldn't really bite like hard foods but then like later on I'll be able to" (P2 T2).

"Well at first it was a bit weird, like it's just normal now" (P4 T1).

"I don't find it painful when I get them tightened no more" (P7 T2).

Participants found that they could eat normally in between orthodontic appointments for adjustment, but had to eat softer foods for a short period (usually a week) after adjustments. There tended to be stages of adaption following appointments, which progressively involved pain > 'weird' sensation > normalisation > a decrease in appliance care over time.

"Yeah, well it depends if I've just got it tightened then I'll be like oh I don't wanna eat like something that will hurt it, so like softer things, but not when it's like between like now I'll just eat anything" (P5 T2)

"Over 2 weeks' I'd say, like go soft food for one week then a little bit harder and then after 3 weeks' you should be fine by then" (P4 T2).

In time there even appeared to be a reduced reliance on the adaptive mechanisms that participants had used.

"I don't really do chop things up as much but I don't know whether that's just coz I can't be bothered to or I just don't feel like I need to anymore" (P5 T2).

"Now if it hurts I just deal with it, coz I can never really find me wax to be honest I like leave it in one place and then it's gone" (P4 T2).

4.2.5 Adjuncts

In order to adapt, participants used a number of adjuncts, such as analgesics, orthodontic wax, interproximal brushes, toothpicks, mouthwash, straws, carrying around water and antiseptic/salicylate preparations (Bonjela© Reckitt Benckiser Inc. Slough, UK)

"It's been like rubbing against the inside of my mouth but I've got like wax for that now" (P6 T2).

"I don't have one on me but I usually carry them on me all the time, it's like a tiny little thing with a brush on the end, and it goes in between the brackets" (P7 T1).

"When I get them changed I do [use analgesics] coz it's the ache and it doesn't go so I have to have paracetamol or ibuprofen" (P1 T1).

However some participants expressed disappointment with some adjuncts, especially orthodontic wax, but also with analgesia. With regard to food trapping, the majority of participants mostly relied on washing the mouth out with water and manipulating the food bolus with the tongue.

"The wax is the worst thing in the whole wide world, it literally, like you put it in and it'll be floating around your mouth within 2 seconds it does not work whatsoever" (P7 T2).

"No, I tried it and it doesn't work… Paracetamol doesn't work" (P2 T2).

4.3 Theme 3: Changes in the patient's behaviour

As well as the interviews divulging how participant's dietary intake had changed with appliances and why they changed, a common theme was the behavioural aspects of dietary modification. The participant's behaviour was affected by social conditions, participant learning, their habits and routines and attitudes towards their appliances.

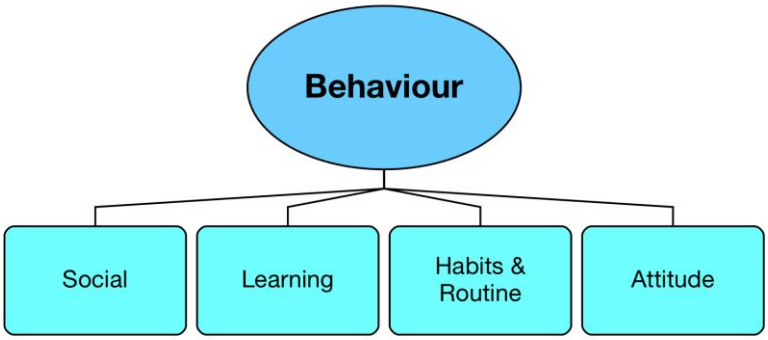


Figure 4.4: Theme 3: **Behaviour** and subthemes

4.3.1 Social

The participants' social history had a major influence on their dietary behavior. A clear message that emerged from the interviews was a feeling of embarrassment that pupils felt at school in regard to eating and most importantly food trapping in the appliances. They felt less anxiety if their friends also had braces as they 'understood'. Participants felt 'awkward' cleaning appliances at school and stated that there was nowhere they could go, although some used the toilets. Many relied on the help of their friends to identify when they had food stuck in their appliance.

"the wire comes out the back and then it's a bit embarrassing coz like, some of my friends do have braces but some of them don't, so they don't really understand, so I have to like go and get it changed and get it put back in, but that's embarrassing coz I don't really want to, they don't really see where I'm coming from" (P1 T1).

"I just like go to the toilet and like get it out… It's not really [embarrassing] just… Yeh I just don't want other people seeing me brush my teeth" (P4 T1).

"If I get like coz I use you know the little interdental brushes so I use them it's embarrassing when I'm eating but I'm used to it now so I don't really realise when anything's stuck in my braces (P6 T2)…*"Only my friend who has braces [mentions food in my brace], we skit each other* (P6 T1).

"I know if we do it I'll be like oh have I got something in my brace and she looks for me" (P7 T2).

The interviews showed that participants feel that fixed appliance treatment is quite common in schools and even desirable as many of their friends also wanted them. The influence of peers who also had appliances was very important, for example a lot of the advice that participants had followed was from their friends.

"No but they always like complain that they want braces and I'm like really? Coz my best friends getting braces but she's on the waiting list and she's like I can't wait and I'm like ok… My older cousin used to have a brace so she used to just tell me you can't eat that or be careful when you eat that or something like that…" (P4 T2)

"Well, my other friend got braces too so she got them before me so in school she tells me what to eat and what not to eat" (P6 T1).

Participants expressed frustration that those around them in their social environment were able to eat whatever they like, but their diet was restricted by the appliance, which was particularly inhibitive at social events such as birthdays. In some instances, this led to the participant eating foods they knew to be wrong, due to a negative influence from a friend. By the same account, some friends with orthodontic appliances were often a positive influence in eating the right foods. At home, participants generally ate the same meals as their parents, however some explained how they made alterations such as boiling foods for longer etc.

"Well, I'd say to some of my friends and family it is different coz they can just eat like whatever they want but like I have to be more careful on what I choose or something, they can just get like whatever they want" (P4 T2)

"If I'm like out with my friends I'll probably eat like less healthy, I'd have more sweets and stuff, like over at my mates house" (P5 T1).

"*Like my best friend has braces too so we practically eat the same things"* (P6 T2).

However, even friends with braces were found to be a bad influence: *"They've got braces but they are a bit more, they are not as careful as me coz they have had them for longer...They just tell me to eat everything coz like that's fine it won't break but there's always breaks"* (P9 T1).

Some participants also reported social impediments associated with a fixed appliance, such as the creation of a lisp.

"I've got a bit more of a lisp than I did when I didn't have braces coz I didn't have a lisp when I didn't have braces but, but now I do" (P4 T2).

4.3.2 Learning

Over time participants learnt what they could and could not eat by training themselves through trial and error. Initially they were fearful of breaking appliances, however with time they gained awareness and understanding of which foods were hard/soft, easy/hard to eat (what they 'can get away with') and how to adapt to eating them.

"I think now coz I have got used to it, and I know what to expect now I know what does and doesn't get stuck (P1 T1)…*It feels at first like there's lots of things in your mouth, there's lots of wires so you don't wanna bite down on them coz you're scared you'll like break them or something but now I know that I won't break them"* (P9 T2).

"It's probably worse the first time [adjustments] coz I weren't really used to it but now I know what I have to do" (P6 T2).

Several participants reported making substitutions in their diet that they perceived to be for the better, however through misunderstanding or miscommunication, the item was in fact harmful to their dentition. There also appeared to be a lot of confusion regarding the reason for avoiding acidogenic beverages, with participants claiming it would 'rot the brace' or 'turn it green' (P3 T2). One participant even described brushing their teeth straight after fizzy drinks so that it doesn't stick to their teeth (P4 T1).

"Like if we stay in someones and they'll have like 'Lucos' [Lucozade, a high sugar energy drink] *and all that and I'll sit there with flavoured water"* (P3 T1).

"Yes I basically more or less stopped drinking fizzy drinks because we used to have it at me Nan's but she has bought flavoured water now instead coz I told her to" (P4 T1).

"Instead of getting a slush I would get flavoured water or something" (P6 T1).

Participants generally recalled some but not all of the advice given to them by the orthodontist and modified their diet. However there were misunderstandings in regard to solid foods as well as acidogenic beverages, in terms of causing demineralisation.

"White squares… I think it is the grease that's going to do that, like if you, we don't cook that in the house like, you go out to eat it so I'm scared I am not able to brush my teeth straight after, I feel like the grease is going to get on and like, and acid deep stuff make it all like dirty" (P1 T1).

4.3.3 Habits & Routine

Over time participants experienced a progression towards normality with appliances and formed a routine where daily wear and adjustments became the norm. Interviews revealed that patients generally got so used to appliances that they 'forgot' they were even wearing them, and this forgetful behavior meant that they do not always consider their food choices.

"I did at first definitely [struggle] like coz it just feels so weird but now that they feel normal it's just the same I think coz like it felt so different so I was just like chewing really carefully and I was quite conscious of them being there coz they didn't feel like my teeth but now they just feel like my teeth..." (P9 T2).

"Sometimes I just forget I have them and I just go to eat like, because if you just bite into an apple the brace will just pop off, so I just keep forgetting and then I just realise before I go to eat that I have got to cut it up" (P4 T1).

Their dietary intake was modified by their habits and routine behaviour, such as extracurricular activities and events. Sport activities were reported to alter their calorific

intake and many reported taking cariogenic/acidogenic beverages to consume slowly whilst partaking in exercise.

"Yeah in dance I usually take like flavoured water or water, not like a fizzy energy drink but like a normal still energy drink. I know it's still as bad for you but like still take it" (P4 T2).

Participants also generally stated that their food intake with regard to appliances was 'worse' on weekends, although this varied greatly with some stating that they eat less at the weekend.

"I do more snacking at the weekend coz I'm at my nan's so I do get a bit bored and just eat" (P4 T1).

"Probably a lot unhealthier, probably more like treats and that when we go out places [at the weekend] but not that bad, I don't think" (P9 T2).

The patient's actual physical habits were also found to be detrimental to appliances, such as picking at the arch wires of their appliances.

"When I had the thin weak one [archwire] I was bending it for like a week or something then the thing came off" (P3 T1).

4.3.4 Attitude

The attitude of the participant clearly had an effect on their dietary intake. Many participants reported behaving in a considerate manner towards their appliances and took responsibility for looking after them.

"I've gone more careful about what I'm eating and like more like panicky in case like something happens when I eat it or something…I care about obviously damaging my teeth and breaking it but I am more careful about both other things than I was before" (P4 T1).

"I think what will be the best [for my brace] and what won't hurt me" (P6 T1).

"I was bending the brace thing that was my fault…" (P3 T1).

Some participants appeared to have a very apathetic attitude towards their appliances and behaved in a very disinterested manner. As far as they were concerned, they didn't change anything and didn't need to change, however on further questioning such patients admitted to multiple breakages and extra appointments. The framework analysis demonstrated a link between those participants who declared an apathetic attitude and also stated an experience of breakages.

"Stick to whatever you eat and drink now, I don't yeah it literally hasn't changed me whatsoever...I think every time I've had it fitted it's broke" (P7 T2)

"Ermm, I don't think it has changed at all to be honest. I still eat the same types of things in the same ways and stuff" (P5 T2).

"I just don't like think about it I just eat normally" (P8 T2).

Some participants initially had quite a naive attitude toward their appliances and believed they would just eat anything they wanted, just as they could before having braces. Such patients would have been told about dietary restrictions before receiving appliances and so either did not process this information or did not believe it.

"Yeah, coz when I first got the brace I thought I could just eat normal and then when I bit down into like toast or something it like really hurt coz it was dead sensitive if you know what I mean" (P4 T2).

Participants gained a more confident attitude with experience of appliance wear, and improved with knowledge of which foods would or would not break their braces.

"I'll probably get used to them yeah, like more confident (P5 T1)…*I think I've just got more confident that they probably won't break as easily as you think they will"* (P5 T2).
"I think I was like less confident of biting but now it's like I know they're probably not gonna break so I'm just like biting normally" (P9 T2).

Many participants stated that they were unperturbed by the modifications made to their diet and that with time there has been a greater acceptance of changes.
"I don't really miss it [old diet] that much" (P4 T1).
"Erm it doesn't really bother me it just takes more time but its fine…Just get on with it" (P5 T1).

4.4 Dietary modifications in the long term

As discussed in the 'Temporal Changes' subtheme, generally participants stated that they had noted an improvement over 6 months, between T1 and T2. One participant even reported that they could now eat steak.
"I can eat like tougher foods now and they don't get stuck as much… Like when I first got it done like they were aching a bit but like but now like it doesn't really when I'm eating" (P3 T2)

Participants revealed how they had experienced initial difficulties and found that the best way to adapt was to build up to harder and more difficult foods.
"Like eat more soft foods like you do like noodles and that, but then you can build it up a bit more if you know what I mean" (P4 T1).

"Eat soft foods at first and like build it up because it is quite hard at first and it's quite like scary like biting with them coz you think they are going to pop off, but they won't probably" (P9 T1).

As discussed above, patients find that they achieve a routine and normalisation with appliance wear over time, which is likely to take place over the course of one month.
"I wouldn't even know they're in my mouth now" (P7 T2).
"I think it's just, quite easy to eat with them and get on with them… it's obviously gotten better for me, I didn't think it was easy, but it's definitely just normal now so its fine yeah… Probably like a month maybe, mm yeah probably a month coz first it like hurt for a bit and then it just feels a bit weird coz you've got all this metal in your mouth but now it's ok yeah" (P9 T2).

The data in this sample would suggest that over time, participants return, at least to some degree, to their previous dietary habits, or at least they feel this to be the case.
"I think the longer you have them the less conscious you are of them so you're not gonna be like worried about breaking them as much or you don't feel them as often so yeah you just kind of eat the same things as you would previously, however you want really" (P5 T2).
"When you get used to it you can eat the same food as you used to but not as hard stuff" (P4 T1).
"I'm just looking at what I want, there's nothing that I don't, most of the time or all the time really there's nothing I think I can't eat so…" (P9 T2).

4.5 Word Cloud

Figure 4.5 shows a word cloud produced from the interviews and allows a visual representation of the interview contents (produced by NVivo 12 software). The larger the representation of a word, the more frequently it was spoken.

Figure 4.5: Word cloud associated with semi-structured interviews

4.6 Diet diaries

It should be noted that diet diaries were included in order to aid the semi-structured interview process and due to the very small sample size (n=9) taken from the interview participants, conclusions should not be drawn from the results. Nevertheless, the results are presented here for interest. The overall results are shown in table 4.2 and figure 4.6, which demonstrates the changes in mean frequency of food types over time.

With regard to 'cariogenic' foods and 'hard' foods, it can be seen that such food types reduced over the initial 6 weeks, and remained reduced at 6 months, albeit to a lesser extent. Acidogenic foods also reduced over the initial 6 weeks of appliance wear, however the mean value rose again over the whole 6 month period, to a level almost as high as the baseline value.

Due to the small sample size and the self-reported nature of these data, these results should be considered with caution, however they do show that in this sample, participants reported reducing the amount of harmful (cariogenic, acidogenic, mechanically detrimental) foods they ate after fitting appliances. It is concerning however, that at 6 months acidogenic attacks had nearly returned to baseline levels, as this is a common cause of demineralisation lesions.

Food type	Baseline	6 weeks	6 months
Cariogenic	2.6	1.8	2.1
Acidogenic	1.5	1.0	1.4
Hard foods	2.6	1.5	1.7

Table 4.2: Mean frequency of food types over time (attacks per day)

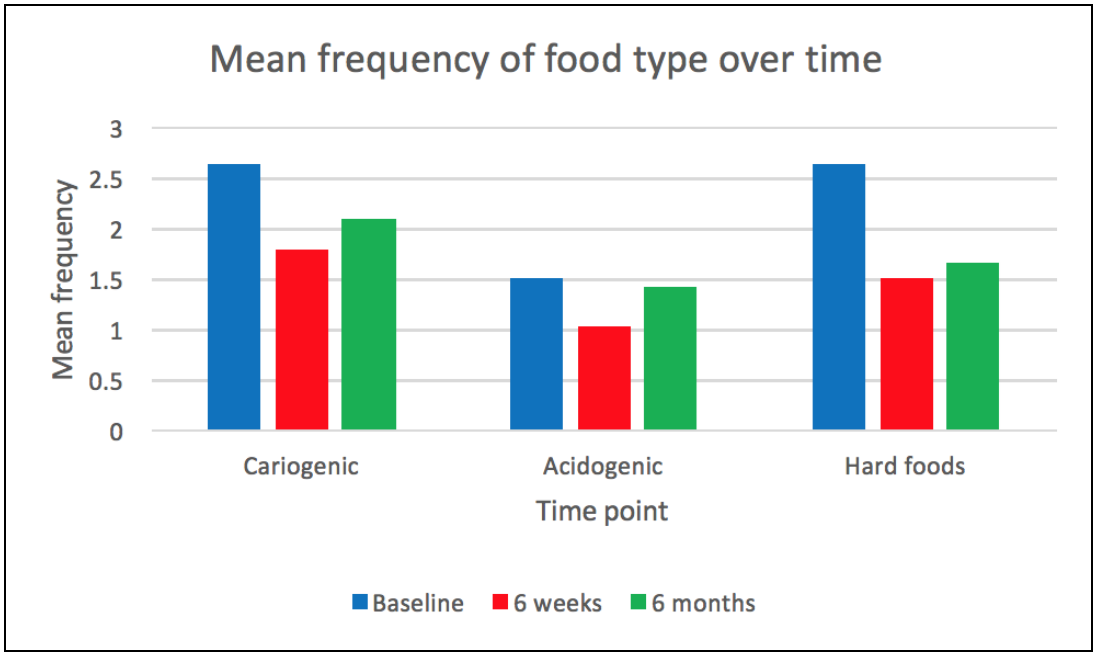


Figure 4.6: Mean frequency of food type over time (attacks per day)

Chapter 5: Discussion

5.1 Summary of the main findings

The results of this study showed that most participants changed their dietary intake with fixed appliances, and that overall they perceived this to be for 5 main reasons. The first was **pain** and tenderness, which usually lasted for approximately 1 week following fixed appliance bond up and also adjustments, although this duration reduced in the long term. The second reason was **difficulties** with eating such as food trapping, thin fragile archwires, difficulties with appliance auxillaries (such as glass ionomer cement- filling material used for bite opening) and extraction spaces, ulcerations and lacerations. The third reason was **concerns** over breaking appliances, including parental reprisal, extra appointments, longer treatment times and fear of appliance removal). The fourth reason was **barriers** to maintaining their diet, which mainly included a lack of time to cut up and masticate their food, as well as cleaning appliances and removing food debris. Barriers also included a lack of places to clean appliances and a social stigma to cleaning in front of peers. The fifth reason was **aesthetic motivations** for changes, whereby participants recognised their opportunity to maximise the aesthetic outcome and the need to modify their ingestion of harmful substances, which may lead to un-aesthetic lesions (enamel decalcification).

Participants adapted their diets via 5 fundamental methods. **Physical alterations** were made by further cutting up of foods, smaller portions and eating more slowly, softer versions of foods, chewing with the back teeth or even tongue and use of cutlery. **Restrictions** of many hard foods such as crusty bread and apples was implemented, usually more so following appliance adjustments with gradual lessening of restrictions thereafter. Interviews highlighted

a number of **substitutions**, for example swapping roast potatoes for mashed, choosing softer crisp varieties, and soft boiled vegetables instead of hard. Over time participants experienced **temporal changes** and found they adapted to eating more challenging foods (see section 5.3), especially between adjustments and with reduced reliance on early adaptive mechanisms. Several **adjuncts** were also used, particularly early in treatment, including analgesics, wax, interproximal brushes, mouthwash, straws, bottled water and topical preparations.

The participants' dietary alterations were reported to be modified by 4 primary behaviours. Their **social** history had a major influence on their dietary behaviour, as they relied on parents/carers to provide the right meals, and on their friends for advice and support, for example by watching out for embarrassing food trapping. At social events, they felt restricted in what they could consume and even suffered social impediments such as a lisp. Participants displayed a **learning** behaviour over time and adapted to appliances via trial and error of difficult/hard foods. There were also several misunderstandings over which foods were harmful. Behaviour was also influenced by **habits and routine**, such as hobbies/activities (such as dance classes) and daily routines altering their food consumption in terms of both timing and volume (increased for example, on the weekend). Some participants behaved with a responsible and considerate **attitude** towards their appliances, however others behaved in an apathetic manner and were quite naive regarding the consequences of appliance wear. Over time participants became more confident with eating practices and developed an accepting attitude stating they were largely unperturbed.

5.2 Why do participants alter their dietary intake with treatment?

Patients in this study reported eating softer foods after treatment, not just because of the advice they received from the orthodontist, but also because of the pain and difficulty they found when eating. Pain experience lasted from 1-2 days to 1-2 weeks following adjustments. This was longer than the general advice given to patients by sources such as the British Orthodontic Society's (BOS) patient information leaflets, which advise appliances are "*likely to be sore for about 3-5 days each time the brace is adjusted*".[33] Al Jawad et al. 2012 also found that pain duration ranged from 1 day up to 2 weeks but decreased during the first few days and ranged from mild to severe.[16] Pain was also caused by ulceration and lacerations of the mucosa, which motivated participants to alter the way they ate.

The results show that patients should expect increased difficulty with mastication if they have undergone extraction based treatment due to a temporarily reduced occlusal table and long spans of fragile archwire. In this situation a thicker or rectangular archwire could be attempted to reduce fragility, however as shown by Mandall et al, different aligning archwire sequences would not be expected to affect patient discomfort.[34]
There are conflicting views as to whether thermal heat-activated nickel-titanium (HANT) archwires have an affect on pain intensity.[35,36]

Food trapping was also a ubiquitous occurrence, which was also identified by similar studies, which claimed that participants suffered from embarrassment after having food caught in their brace and were frustrated by the constant need to clean.[1,16]

In common with other studies,[1,16] participants restricted their food choices because of concerns over breakages and also encountered barriers to maintaining their usual diet such as time constrains when eating and cleaning. Aesthetic motivations were not discussed in other studies, however the participants in this study eluded to the importance of educating and motivating patients to modify their dietary behaviour, for example with clinical photographs of demineralisation lesion.

5.3 How do participants alter their dietary intake with treatment?

Participants altered the way they eat by reducing the amount they consume, as well as increasing the time taken to eat. Carter et al. found that this increase in eating time was influenced by how long the participant had worn their appliance and where they ate, as participants felt pressure to keep up with their friends, which led to decreased consumption.[1] This aspect was also found in our data, which was able to demonstrate that participants perceived their meals to take longer, but this study was also able to follow up participants at 6 months into treatment and showed that in the long term patient no longer felt that their meal duration was increased.

The participants in this study altered their dietary intake with adaption methods that were also found in other studies,[1,16] for example increased preparation of food (cutting it up), substituting hard or crunchy foods for softer foods, and they described restriction of the exact same food types, namely apples, carrots, crisps, chocolate and nuts. The studies also detected a strong positive (healthy) effect of food choice restrictions, however this aspect was not discussed by participants in this study until instigated by the interviewer. Participants felt the changes were healthier for their teeth but had not considered their general health.

In the interviews, the participants reported using many different adjuncts to facilitate appliance wear, most notably analgesics and orthodontic wax use. Some participants stated that they had avoided chewing gum either due to the orthodontist's advice or fear of breakages. However a recent paper by Alshammari and Huggare (2018) suggests that chewing gum provides equivalent pain relief to paracetamol and is not a risk factor for bracket loss in the short term.[37] Chewing gum may be another useful adjunct as it theoretically relieves inflammation/oedema by restoring the blood circulation to a compressed periodontal ligament. Recent randomised control trials have also shown a chewing gum to be effective at pain relief.[38,39]

5.4 Additional factors which affected participants' dietary intake with treatment?

Some participants explained that they altered their dietary intake by not eat at school and take longer to finish meals. Pupils have been found to eat less at school in order to keep up with their peers, which could have nutritional implications in the long term leading to detrimental consequences for their academic performance due to a lack of concentration.[1] They reported anxiety and embarrassment with eating and avoided speaking afterwards due to the fear of having food stuck in their brace. However this was reduced if they had eaten in front of the group before and if members of their peer group also had braces.[1] Conversely to these negative effects of fixed appliances, Johal et al. 2013 presented a prospective cohort study which showed no significant detrimental effects of fixed appliances on dietary intake/behaviour, BMI or fat percentage, during the first 3 months of treatment.[2]

In England schools maintained by the local authority are required to be open for at least 380 sessions (190 days) per year,[40] and pupils attend approximately 714 hours of secondary school per year.[41] As pupils spend a considerable amount of time in school, it is very important to consider the dietary habits of appliance wearing patients during these hours.

The influence of our patients' friends should not be overlooked as participants in this study reported both positive and negative influences from friends with fixed appliances, which led to the consumption of healthy and harmful foods respectively. Gill et al 2008, also highlighted the significant effect that peer-pressure can have on children's food choices in both sexes,[42] however the current study builds on this by demonstrating how peer groups can have beneficial effects with regard to diet modification in line with fixed appliances, by providing a social network of positive influences and feeling of solidarity with those experiencing the same situation.

Participants also described how appliances affected their speech and gave them a lisp. This finding is supported by Bernabe et al 2008, who found that speaking was one of the most commonly affected daily performances[43] and Sergl et al 2000, who demonstrated a significant decline in the intensity of impaired speech 4 days after placement of appliances, which continued until day 7. However this was found to be worse with functional and bimaxillary removable appliances.[44]

The participants were able to learn new behaviours in order to adapt to their new appliances and, in common with other studies,[1,16] initially learnt about coping mechanisms from their orthodontist. Unfortunately, there also appeared to be a lot of misunderstanding regarding harmful food sources and appropriate substitutes. Many participants actually attempted to

modify their diet, only to fall foul of making substitutions for other harmful foods, most commonly ‘flavoured water’. This demonstrates the significance and value of thorough patient instructions/ information delivered prior, and ideally subsequent to, appliance placement.

Sergl et al 1998, discovered that patients’ attitudes before having appliances affected the intensity of complaints within 1 week of treatment. For instance, if patients felt their malocclusion was more severe, there were fewer complaints of pressure, sensitivity and pain. This in turn may predict patient acceptance of treatment and compliance. Participants who showed attitudes characteristic for internal control orientation (locus of control theory),[45] adapted to treatment faster and had less pain.[10] Therefore such participants believed that they were the one responsible for their treatment outcome, without relying mostly on chance or others. In this study, this attitude was show by participants who took responsibility for their appliances and were accepting of treatment. Such psychological factors may influence patients’ adaption to discomfort with appliances.

Some participants displayed a naïve attitude regarding the amount of disruption that their appliance would have on their dietary habits. A questionnaire survey by Sayers and Newton, established that 12-14 year-olds had a significantly greater understanding of the dietary restrictions which would apply to fixed appliance wear compared with their parents, however this was not particularly true of the participants in this study.[17] This emphasises the importance of educating the carers/parents about restrictions with appliances, as well as the patients.

5.5 Longitudinal changes over six months

A strength of this study was that it explored change over time and demonstrated that following initial difficulties, participants subsequently became much more confident regarding their appliances in the long term. They reported improved masticatory practices and were largely able to adapt to appliance wear in order to recover most of their masticatory ability. In fact, some participants stated that the appliance had made no difference to what they ate. This finding was in contradiction to Al-Jawad et al 2012, who found that all participants reported that their diet had altered as a result of treatment.[16]

All participants claimed to have an improvement in their adaption to eating with appliances over the initial 6 months of treatment. Some described increased eating speeds with time, so that meal duration returned to be more in line with pre-treatment times. After 6 months, participants often noted a feeling of normality with regard to their appliances and 'forgot' they were wearing them. They became increasingly confident that eating would not break the brackets or wires. A frequent declaration was that of decreased pain duration after fixed adjustments ('hours instead of days'), and some proclaimed they had no pain at all at that point.

The data showed that initially participants tried to eat the same diet but with a different method, however over time and with experience, this turned into a change in what they ate instead of 'how' they ate, as restriction was simply easier. For some participants, the major focus of their anxiety appeared to change from a fear of breakages to concerns over the health of their teeth.

Participants felt that less adaption was needed in the long term and often appeared to display less care for their appliance. They recorded a decreased reliance on adjuncts such as interproximal brushes for food trapping (with increased tongue manipulation) and reduced wax use as it was perceived as ineffectual.

Long term changes may have been due in part to the application of thicker wire/more stable appliances and possibly also space closure. The most likely reason for the majority of the improvements seen was the increased experience of the participants, who had learnt which foods they would struggle with over time.

5.6 Strengths and Limitations

To the best of the author's knowledge, this trial was the first longitudinal qualitative study to investigate how patients' dietary intake changes with fixed appliance therapy and the reasons behind these changes in both the short and long term. A previous study[1] has highlighted the influence of time on the confidence of patients with fixed appliances as well as their fear of breakages, however it was not possible for them to investigate this phenomenon longitudinally.

Conducting 2 interviews approximately 4 ½ months apart may have had advantages in terms of participant familiarity, whereby the participants felt more comfortable in the second interview and appeared to be more open. They may have noted that the issues discussed in the first interview were not raised by their orthodontist, confirming that confidentiality had been maintained, and reinforcing their trust in the interviewer.

In addition, it would be reasonable to anticipate that the interviewing ability of the researcher would have improved over time as further experience was gained, therefore T2 interviews may have gathered richer data than T1 interviews.

Another strength of this study is that all participants entered at the same stage as all T1 interviews were conducted at 6 weeks into treatment and all T2 interviews took place at 6 months. This allowed for uniform comparisons of participants, the ability to accurately examine the difficulties participants had at specific time points and to investigate contrasting circumstances over time.

A research diary was kept throughout all of the interviews, in order to allow an iterative process, whereby the topic guide and hypothesis were altered as interviews progressed.[46] In order to increase validity, a reflexive approach was taken by using the research diary and transcripts to consider what was going on in the interviews and how the researchers own perspective may have influenced the data. The data were also analysed by 2 investigators independently, although this has become a less credible measure of quality as one researcher usually knows the data better than anyone else, so the second researcher may rely more on personal preconceptions, and also individuals from a similar biomedical background are likely to bring similar biases.[47]

This study did however, have several limitations. Unfortunately at baseline, there was not a wide range of ethnic backgrounds in the study because even though there was a purposive sampling method, other ethnicities were not available. Another Asian participant was recruited but dropped out before the interview stage. This limitation is also true of the balance of gender in the study. Regrettably, only 1 male participant was recruited, however this was not due to any refusals to participate, this simply reflected the cohort of patients presenting at the time of the study. There appeared to be a range of participants with different socio-economic backgrounds in the study, however this was not formally assessed.

A formal sample size calculation was not undertaken as it was not relevant for qualitative studies, however the sample size proposed was based on a previous similar study.[16] This study had a small sample size but this was not a limitation as participants were recruited until the point of saturation, where no new themes arose, and then further interviews were conducted to be sure of saturation.

To negate the influence of the hospital setting from biasing the participant responses, interviews were conducted in a non-clinical environment, using seminar rooms with chairs arranged around a desk in a non-confrontational manner and with non-clinical attire worn by the interviewer. Unfortunately this was still inside the hospitals and therefore may have influenced their responses. In order to reduce bias, the best setting may be a familiar environment, such as the participants' own home.[1,42]

The presence of the participants' parents for some interviews (at participants' request) posed a dilemma in this study as it could lead to bias as the child may not feel that they can be completely honest. However, it was helpful in some cases as the parent was able to facilitate the interview by prompting/reminding the child to answer the questions more effectively.

The topic guide and therefore lines of questioning in the interviews did not consider the various treatment plans that participants were undergoing. This could have biased results as different treatments, for example quad helixes and extraction plans, could possibly have affected the comfort and eating patterns of participants.

The data gathered may also have been biased by the mood of the participant and while all interviews were aimed to take place in the morning, logistically this was not possible due to clinic times and the participants' schedules. They may, therefore have been fatigued and less conversational. However, where possible the environment was kept as quiet and comfortable as possible, and refreshments were provided.

5.7 Clinical relevance of findings/ implications of results

The results of this study elucidate the challenges that patients face while attempting to maintain their dietary habits during fixed appliance treatment. The outcomes may be used to aid patient/parent education and as part of the informed consent process. Advice should be tailored to the individual patient and will depend on their social background and clinicians could even enquire as to the orthodontic experience of their peers, as a source of advice/support.

The outcomes provide practical advice for new fixed appliance patients, for example:

- Expect:
    - Pain/soreness- which will decrease over time but recurs with adjustments
    - Food trapping – becoming easier to manage with trial and error of foods
    - An improvement with difficulties over time
- Even some soft foods will trap in the brace and may need avoidance
- Avoid chewing/incising with the front teeth
- Avoid hard foods
- Use adjuncts such as interproximal brushes etc. (as outlined in section 4.2.5)
- Cut food up into smaller pieces
- More time will be required for meal times
- Seek advice from friends/family with appliances
- Substitute foods for softer or healthier versions
- Increased difficulties are encountered with extraction spaces and appliance auxiliaries

There were also messages for the orthodontist, suggesting our greatest role in helping patients adapt may be to adequately prepare them for the disturbance they will encounter. We need to motivate our patients and induce a condition of internal control orientation (locus of control theory),[10,45] where they take responsibility for their own appliance, in order to guide them into correctly facilitating the treatment. This behaviour can be reinforced, for example by informing patients that breakages can also be painful. Participants reported pain as an appliance was broken, and this led to them taking more care following this event.

We also need to be mindful of the difficulties patients face with our instructions, for example participants commented on the poor performance of adjuncts such as wax, and there may be instances where adaptions could have been made to appliances to avoid its use. On the practical side, the results indicate that we should consider using more gentle pressure when placing modules over anterior teeth, consider using thicker/rectangular archwires with extraction spaces or the use of closed coil or bumper sleeve to aid patient comfort.

5.8 Direction for future research

This study has shed some light on how adolescent patients feel about dietary changes with fixed appliances, however there are still questions which remain unanswered. It would be beneficial to conduct a similar study to investigate how orthodontic treatment affects dietary intake in different ethnicities, as well as with different age groups such as adult cohorts, and different appliances such as aligners, which are much more commonly used in adult patients. Would their dietary modifications have the same aetiologies and adaptions? In the same vein, another study might also investigate any variation associated with different levels of socio-economic backgrounds. There may also be scope to further investigate how patients feel about enamel decalcification lesions and their impact on aesthetics.

Diet diaries were used to aid the semi-structured interviews and therefore did not have a high enough frequency from which to draw conclusions. They were not designed to produce robust quantitative data, however a future study could aim to utilise a much larger sample size, in order to investigate the actual foods which patients ate in a quantitative manner. Again, this could be scrutinised in both the short and long term.

A qualitative approach was used to investigate the dietary practices of an orthodontic cohort, but a future study could use the same methodology to explore patient perceptions of tooth brushing habits and appliance care measures. This information could then be used, alongside the results of this study, to improve our knowledge of the aetiologies, modifications and behaviours of participants in regards to oral hygiene methods and dietary behaviours, which could lead to improvements in patient compliance with instructions and decreased iatrogenic risks.

Given the multi-media platforms available to adolescents today, a smartphone/tablet application could be developed to record patients' diet diaries as well as oral hygiene practices and simultaneously provide feedback, recipes/dietary advice, links to pertinent web-sites and positive reinforcement of appropriate behaviours. A survey methodology could also be used to explore social media influences on adolescent patients, such as 'brace bloggers'. This study design could demonstrate what kind of information is on social media and what platforms adolescents use. Could the increase in social media platforms like 'Instagram' be the reason that participants in this study stated that there was increased demand for orthodontic treatment among their peers?

Chapter 6: Conclusions

The results of this longitudinal qualitative study demonstrate that:

1) Initially participants struggled to maintain their dietary habits due to pain, difficulties such as food trapping, and concerns over breakages. Dietary modifications were made by restricting food choices, adjunct use, and physical alterations such as further cutting up foods.

2) In the long term reliance on modifications and adjuncts were generally reduced and some patients were able to return to their previous dietary habits.

3) The following themes were identified as factors which influence dietary modification associated with orthodontic fixed appliances:

    a. Aetiology of changes
    b. Adaption
    c. Behaviour

The results have elucidated the difficulties which our patients face with fixed appliances and this knowledge could be used in formal orthodontic training programmes and also to both motivate and educate patients using a more precise prediction of what they will experience, therefore facilitating the informed consent process. Various forms of media could be used to disseminate this information such as patient information leaflets and multimedia platforms such as smartphone applications. Such information also has implications for the dietary

health of patients, their clinical management (such as reducing breakages), and therefore the cost of treatments.

Part B

A content analysis of UK television food advertisements: A dental and orthodontic perspective

Chapter 7: Literature review

7.1 Harmful effects of food advertising on television

In recent years there has been growing concern over the amount of exposure that children have to televised advertisements for foods which are high in fat, salt or sugar (HFSS). It is interesting that links have been made to school holidays and peak child viewing times, when children have increased exposure to advertisements.[48–50] Childhood exposure to advertisements for HFSS foods is very important as it has implications for dietary health and body weight, and therefore dental and overall physical health. In Britain children are watching three hours of television (TV) per day and almost two-thirds have a television in their room.[51] British children are exposed to approximately 20,000 advertisements on TV per year, the highest levels in Europe, which makes them a very lucrative market for the multibillion pound marketing industry.[52] Indeed, there is evidence that advertisements for food products which are shown on television can directly affect a child's attitudes, dietary choices, and intake. [53,54,55,56]

Advertisements for food can have very powerful effects as they attract a child's attention, forcing them to accept a product and even lead to the child pestering parents to buy such items.[56] A qualitative paper conducted in 2015 demonstrates parent's views on the impact of televised commercials on their children with some parents stating that following exposure to

such advertisements, the child will request that such an item is purchased in the next shopping excursion.[57]

Studies have shown that children who spend significant time watching television have higher levels of obesity, consume fewer fruits and vegetables and are more prone to snacking.[58] Gatou et al (2016) report that children who are exposed to advertising involving sugary foods display a short-term preference for similar foods, and that those with an existing high caries risk are more sensitive receivers of advertising for sweet foods.[59]

Many reports have also highlighted a link between television viewing and poor oral health, most notably dental caries.[59–64] Such studies show that caries prevalence is higher in children who spend an increased amount of time watching TV, usually from lower socio-economic families.

7.2 Possible solutions

After mounting evidence of harm from exposure to HFSS advertising, the World Health Organization (WHO) has concluded that greater efforts should be made to reduce exposure on a global level.[65] In Quebec, Norway and Sweden there are already bans on advertisements targeting children under 12-13 years-old. Attempts to decrease children's exposure to HFSS food advertising have taken place in three main forms: statutory regulation, self-regulation and educational approaches.[66]

7.2.1 Statutory regulations

7.2.1.1 The situation in the UK

In the UK, the Office of Communications (OfCom) have been commissioned by the Government to act as the independent regulator of television, and previously reacted to increasing concerns over childhood obesity and disease related to poor dietary intake. In 2004 the regulator came to the conclusion that advertising had a modest direct effect on children's food choices and an indirect effect on their food preferences, consumption and behaviour.[67] This led to the Department of Health considering the need to restrict the exposure of children to the promotion of food and beverages that are high in fat, salt and sugar (HFSS).[68]

To determine which foods and beverages are HFSS and therefore subject to the regulations, a Nutrient Profiling tool (developed by the FSA in conjunction with the University of Oxford) is used to attribute a score to foods based on the contribution of beneficial nutrients to a child's diet (e.g. proteins, vegetables, nuts etc.). This is then compared, using an algorithm, to the contribution of excess nutrients (e.g. saturated fatty acids, sugar etc.), and the score calculated based on a 100g portion of food.[69]

Following consultations, restrictions were applied to food and drink advertisements on television that were aimed at children. This was implemented in three stages, from 1st April 2007, when HFSS advertisements could not be aired in or around shows of particular appeal to children aged 4-9 and children aged 4-15 years old from 1st January 2008.[67] Finally, on 1st January 2009 all HFSS advertising was banned from children's channels.[70] Such programmes have at least a 20% higher proportion of children viewing than the proportion of children

present in the general population. OfCom believe these regulations have reduced the exposure of children to HFSS advertising by 37%. [70]

However, independent academic evaluations have drawn different conclusions and believe that advertisers are able to circumvent the regulations with advertisements during other programming such as family viewing (with far bigger audiences numbers as children watch more family programming than child specific),[50] and evidence shows that low nutritional value foods are still promoted,[71] negating the policy aims to reduce HFSS promotional exposure.[56] A cross-sectional study comparing exposures before and after the OfCom regulations revealed that despite good adherence to the regulations, the relative exposure to HFSS advertisements actually increased, via a shifting of advertisements to family programming where children spend more of their viewing time.[72]

7.2.1.2 American regulatory issues

Unfortunately, there are great barriers to implementation of regulations/restrictions in the US. In the 1980s, the Federal Trade Commission (FTC) reviewed television advertising to children and considered restrictions. Their overall conclusion was the need for a ban on advertisements to young children. However, many bodies including confectionery manufacturers, advertisers and televisors formed a coalition of opposition to prevent FTC restrictions, using legal action and lobbying US congress. On 2nd October 1981 the FTC were forced to publish their decision not to proceed further with restrictions.[73,74]

The world's first sugar-sweetened beverages (SSBs) warning notice law was due to be implemented in San Francisco in 2016, which required all billboard SSBs advertising to

include: "…Warning: drinking beverages with added sugar(s) contributes to obesity, diabetes, and tooth decay…". However, based on the 'First Amendment freedom of speech rights', the beverage and billboards industries were able to sue for a temporary injunction to block this law; although the motion was later denied.[75]

On the other hand, the Food and Drug Administration (FDA) have approved the use of health claims on products containing sweeteners that may state claims such as "May reduce the risk of tooth decay", providing they meet FDA criteria such as not reducing plaque pH below a key value of 5.7 and containing non-cariogenic sugar replacers.[76]

7.2.2 Self-regulation

The food industry themselves have developed guidelines to reduce the exposure of HFSS foods to children, following mounting criticism. Recommendations and commitments have been produced by many bodies such as the International Chamber of Commerce's (ICC) Framework for Responsible Food and Beverage Communications, the Confederation of the Food and Drink Industries of the EU (CIAA), and the International Food and Beverage Alliance.[77] Such commitments involve only advertising healthier products to children under 12 or not advertising HFSS foods at all, and also to reduce advertisements in schools.

Similarly in the US, companies are involved in the Council of Better Business Bureaus Children's Food and Beverage Advertising Initiative (CFBAI) (agreeing to achieve healthier products/lifestyle for 50% of child advertising), with similar commitments from trade associations in Australia and Canada.[78] However, a major downside to this self-regulation is that companies can decide for themselves which products are thought to be healthier. [77]

7.2.3 Educational approaches

Another preventive strategy may be to educate parents and their children about the uses of advertising and the techniques used to persuade buyers, the idea being that children will be able to evaluate advertisements and realise the negative effects. There is evidence this approach can improve health outcomes with regard to alcohol and eating disorders.[79] However, there is a risk that educating children regarding advertising may focus their attention, increasing the advertising effect.[80]

There is little evidence available regarding educational approaches, however a study by Bickhamand and Slaby in 2012 demonstrated some improvement with beliefs and desire to consume cereal but there was little data on behaviour.[81] Rozendaal et al 2011 stated that understanding advertising was unlikely to decrease its influence [82] and overall educational approaches do not appear to be effective tools in combating HFSS food advertising.[66]

Harris et al proposed a food marketing defense model to counter harmful food marketing, which included addressing awareness, understanding, ability and motivation to resist.[83] However, this paper also demonstrates why educational approaches are likely to have limited efficacy, as children need the motivation to resist as well as the capacity to recognise advertisements.

7.2.3.1 Media education/awareness

In the media, there has been celebrity involvement in the topic, most notably by celebrity chef Jamie Oliver, who lobbied and raised awareness of the close relationship between sugar

and dental decay. As a result of his programme '*Sugar rush'*, a 125,000 signature strong petition called for a tax on sugary drinks, causing parliament to consider a debate. His efforts were commended by the British Society of Paediatric Dentistry (BSPD), for supporting the dental profession and focusing the attention on food and drink labelling.[84]

A body called Action and Information on Sugars complained to the Advertising Standards Authority about an advertised claim from 'Ribena Toothkind' stating that it 'does not encourage tooth decay' (which was accredited by the British Dental Association, whose name appeared on the drink), following proof of cariogenicity by Zurich Dental School. The high court ruled that the claim was misleading, leading to public humiliation for 'Ribena Toothkind' (GlaxoSmithKline), lost revenue and withdrawal of the product with associated loss of promotional costs.[85]

A BSPD policy document on sugars and children's oral health urged the government to review advertisements of food and drinks in regard to their possible detrimental effects on health, particularly in regard to television media. They considered regulatory control to be inadequate and were concerned about sponsorship of televised programmes.[86]

7.2.4 New strategies

In 2013, Dietz proposed that although federal efforts have been modest at best, other strategies could be used to improve food marketing to children, such as political lobbying from parents, counter-advertising via social media, and new technologies to decrease exposure. Parental trust is key in the food industry and so heightened awareness may cause parents to petition for increased regulation or prompt changes from food companies.

Although there is a clear association between TV viewing and obesity, it is thought that only 40% of paediatricians discuss the matter routinely.[87] However, parents may see television as an important distraction while completing other tasks.[88]

Social media can be used to counteract harmful advertising by employing the same media that advertisers use to demonstrate the adverse effects of such products, for example, recent demonstrations of adverse health issues caused by sugary drinks were aimed at Coca-Cola advertisements. New technologies are being developed which could limit marketing exposure. TiVo offer an 'ad-skipping' device but unfortunately it still requires the user to actively skip the advertisement, an app called 'Adblock Plus' is able to block advertisements on the internet and social media, and the FTC have suggested a smartphone mechanism for blocking tracking from marketing networks, however demand for such a market is lacking.[88]

7.3 Content analysis- studies from other countries

Around the world there have been many content analysis studies produced, which mostly focus directly on child-specific programming and most are from the prospective of HFSS foods and obesity. Many also aim to investigate variation in advertising for HFSS or cariogenic foods over the year, especially during school holidays. Few studies are focused on dental health and the programming that children watch in the greatest numbers. Therefore this study will focus on this new and important area, which has implications for future regulations of unhealthy food advertisements that children are exposed to. The data collected can also be useful to inform policymakers with regards to foods that are 'healthy' from an obesity perspective but are detrimental to dental health.

7.3.1 United Kingdom

A content analysis of children's television advertising in the UK, with specific regard to oral health, was conducted by Al-Mazyad et al in 2012. Three hundred and fifty-two hours of programming was recorded and 9,151 advertisements were evaluated. The study found that food and beverages were the second most commonly advertised items at 16.7%. Nearly two-thirds of food advertisements were for items harmful to dental health and 96.6% of those were cariogenic. The study also found that food sources potentially harmful to dental health were significantly higher during peak children's viewing times, compared with non-harmful foods. The study concluded that children in the UK are subject to a high proportion of advertisements detrimental to oral health during peak viewing times and adjacent to their favourite shows.[49]

In 2005 Rodd and Patel also completed a content analysis in the UK, focusing on ITV1 as the main UK commercial channel. Almost 1000 advertisements were assessed and the results show that 24 advertisements were shown per hour, 34.8% of advertisements were for food/drink items and similarly to the Al-Mazyad study- 95.3% of these items were potentially cariogenic. Again the most popular food and beverage items were cereals with added sugar, followed by confectionary at 23.7%.[51]

Morgan et al also conducted a content analysis of children's TV in the UK. After assessing 503 hours of advertising, this study found that 16.4% of advertisements were devoted to foods, but only 6.3% of all advertising time was for potentially cariogenic items. The most commonly advertised high sugar foods were sugared cereals followed by sweetened dairy items and confectionery. Again the authors found an association with school holidays.[48]

7.3.2 Australia and New Zealand

An Australian content analysis study by Zuppa et al in 2003 revealed that 79% of food advertisements were for non-core foods and that chocolate/confectionery and fast foods constituted almost 50% of all televised food advertisements. The advertisements found did not comply with the Australian Guide to Healthy Eating (AGHE) recommendations for healthy eating.[89]

Forty-two hours of children's programming from New Zealand were assessed for food promotions and associated nutritional value and out of 269 advertisements, 63% were found to show HFSS foods. The authors state that based on this diet alone, a child would consume too many HFSS foods and be deficient in fibre and micronutrients such as magnesium, selenium and vitamin E. Importantly for this community, none of the advertisements featured healthy foods related to Maori and Pacific peoples.[90]

7.3.3 India

A 2012 oral health content analysis study of advertisements on children's Tamil television channels demonstrated that 50.36% of total advertising time was for sugar-rich rood sources. Solid and sticky items contributed 100% of items in this category, however oral hygiene products made up just 1.9% of all advertisements. Foods high in sugar were found to be broadcast more commonly on Chithiram channels, during prime viewing hours and in school holidays.[91]

7.3.4 Iran

Interestingly, in contradiction to content analyses from other countries, Iranian television demonstrated that non-cariogenic food products (12.09%) were advertised more frequently than cariogenic foods (2.8%). Marketing was found to place more emphasis on the emotional appeal of cariogenic foods, compared to a rational approach to non-cariogenic foods. Advertisements for plaque control methods were very infrequent at just 0.2% of advertisements.[92]

7.4 Other media sources

Online marketing now combines advertisements with content in computer games called 'advergames', for example by repeatedly showing a food product as the child searches for game items with a cartoon character. Other techniques include online videos, text messaging, video games and social networks for marketing, which can now be more targeted to the user following personalisation from demographic data, cookies, social media posts and purchase history.[88]

A content analysis of children's magazines in the UK was conducted in 2014, demonstrating that out of 508 food references, a staggering 73.6% were for food sources harmful to dental health due to high sugar levels and/or acidogenic potential. The most frequent food items were baked goods and sweets, and over one-third of magazines contained free sweets.[93]

Children are marketed to via many different sources and while digital marketing is a growth area, children still spend a lot of time watching television and are therefore continuing to be exposed to televised food advertising.[94]

7.5 Dental caries

Dental caries is a chronic infectious disease resulting from the metabolism of dietary carbohydrates by oral bacteria leading to a reduction in pH and demineralisation of tooth tissue.[95,96] This reduction in pH (from neutral to around 5.0-5.7) occurs as a result of acid production by a group of bacteria, with Mutans streptococci and Lactobacilli species being identified as the most important organisms due to their acidogenic and aciduric abilities.[97,98]

Dental caries continues to be a major public health problem and the Child Dental Health Survey (2013) reported that 46% of 15 year olds, 34% of 12 year olds, and 46% of 8 year olds had obvious dental decay affecting their permanent dentition, with a vast proportion going untreated. Levine and Stillman-Lowe (2004) report a higher prevalence of dental caries affecting people of lower socio-economic status.[99]

Dietary sugars found within food and beverages were classified for dental health purposes in 1989 by the Department of Health Committee on Medical Aspects of Food Policy (COMA) and sub-grouped into intrinsic and extrinsic sugars. Intrinsic sugars are naturally integrated into the cellular structure of food such as those found within fruit and vegetables, whereas extrinsic sugars are located outside the cellular structure in a free or added form and are therefore more readily available for metabolism by oral bacteria. Extrinsic sugars are further classified into milk sugars such as lactose found in milk products and non-milk extrinsic

sugars (NMES) such as those found in fresh fruit, fruit juices, table sugar and confectionary.[98] The NMES are cariogenic and therefore potentially damaging to oral health with a maximum recommended dietary reference value of 60g/day, equating to around 10% of a person's daily energy intake. [100,101]

The Nizel and Papas classification sub-groups high-sugar foods and beverages according to the extent of their oral retention. These sub-groups are liquids (soft drinks, ice cream, fruit juice), slowly dissolving foods (hard sweets, cough drops) and solid/sticky foods (cakes, biscuits, chocolate, toffee and chewing gum).[102]

The British Food Standards Agency (FSA) developed a traffic light style signposting system for nutrition labelling to aid consumer choice when purchasing food and beverages. The traffic light system indicates the amount of fat, saturated fat, sugar and salt (see appendix 7). It uses three colours to ensure that the signposting system is a clear tool to help people make healthier food choices; red (high content), amber (medium content) and green (low content).[103,104] The FSA defines sugar levels specifically (g/100g or 100ml) as 32.6 (red-high content), 9.0 (amber-medium content) and 1.8 (green-low content).

Starch-rich staple foods (bread, potatoes, and cereals) are a major component of the human diet and can be raw or cooked/refined. Raw starch (raw vegetables) have low cariogenicity whereas cooked or refined starches can lead to dental caries particularly if combined with sucrose such as in biscuits and cakes.[105] In 1996 Hussein, Pollard and Curzon [106] reported that fruit and fruit sugars are acidogenic, however, they are largely non-cariogenic.[107,108] The exception to this includes fresh fruit juices and dried fruit as the juicing and drying processes release sugars from the fruit structure resulting in increased levels of NMES.[98,109]

Cow's milk contains lactose which is the least cariogenic of the dietary sugars, and also contains calcium phosphate and casein which can further prevent the demineralisation of enamel, resulting in milk sugars being considered as virtually anti-cariogenic.[110,111] Although nutrition labels provide information regarding the total sugar content of foods and beverages some sugar-free products such as chewable vitamins contain oligosaccharides, maltodextrins and glucose syrups. These are often not identified on nutrition labels and are potentially cariogenic, although the evidence is poor.[112]

The Department of Health Committee on Medical Aspects of Food Policy (COMA) advise that non-sugar bulk and intense sweeteners (saccharin, aspartame, sorbitol, xylitol) are non-cariogenic and that efforts should be made to supplement dietary sugars with sweeteners to reduce the risk of caries development.

Chapter 8: Aims and Objectives

8.1 Aims of study

To examine the prevalence and nature of food and beverage advertising on UK television during peak family viewing programming, with specific regard to items that may be harmful to patients with orthodontic appliances.

8.2: Objectives of study

1. Determine the amount of food and beverage advertising during peak family viewing times.
2. Investigate the proportions of core/healthy foods, non-core/unhealthy foods and miscellaneous foods that are advertised.
3. Examine the amount of advertising for:
    a) Cariogenic foods and beverages
    b) Acidogenic foods and beverages
    c) Foods with benefits to oral health e.g. anti-cariogenic &/or anti-erosive effects
    d) Mechanically or chemically inappropriate foods for appliances
4. Examine the amount of advertising aimed at improving oral health &/or appliance wear.
5. Investigate any factors associated with advertisements for items that are harmful to dental health, such as channel variations, programme category, health claims, primary target, and broadcast times.

Chapter 9: Methodological framework

9.1 Research design

Part B of this study was designed as a content analysis of pre-recorded televised advertisements and was conducted retrospectively

9.2: Criteria

Inclusion criteria

All advertisements before (from the previous programme until the programme in analysis) and during the selected programmes were included in the analysis.

Exclusion criteria

Programme sponsorship was excluded from the analysis due to their variable nature. Although this could have altered the results, any perceived exposure to food promotion on television is likely to have be underestimated.

9.3 Sampling procedure

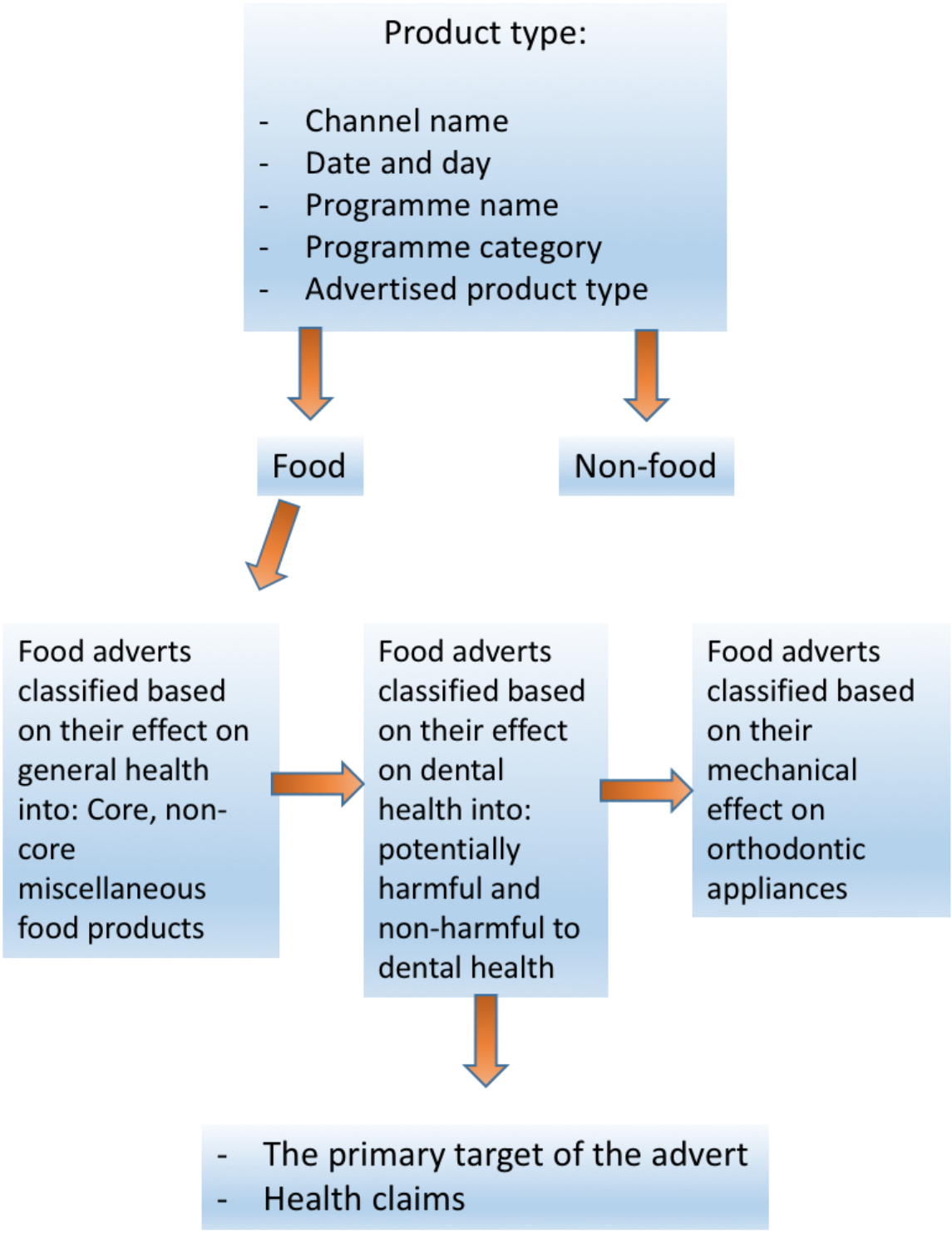
The sample of television advertising included eighteen and a half hours of television from consecutive Friday and Saturday evenings, shown between 6pm and 9pm, over four weeks between 27/01/17 to 18/02/17 (8 separate days). The programmes associated with the advertisements assessed were chosen either because of their popularity with child audiences

in the weeks before the study or when shown previously. The sample only included programmes from commercial channels during the study period and included the following:

- **The Voice** – Shown on Saturday night (ITV), was selected as the previous series, shown on BBC1 in 2015, was the 6th most watched show among 4-15 year-olds.[94]
- **Ninja Warriors** – Shown on Saturday night (ITV), was selected as the 3rd most watched show on a commercial channel among 4-9 year-olds in 2015.[94]
- **Coronation Street** – Shown on Friday night (ITV), was selected due to the large child viewing audiences the week before the study period.[113]
- **The Simpsons** and **Hollyoaks** – shown on Friday night (broadcast on Channel 4 and E4 respectively), were selected as they were the most commonly viewed programmes by children on their respective channels in the weeks before the study period.[113]

9.4 Study Design

Advertisements were coded according to the following flowchart (also see '*Collection and handling of data*'):



9.5 Sample Size

Eighteen and a half hours of programming were assessed, which produced 709 advertisements to evaluate.

9.6 Collection and handling of data

9.6.1 Coding

A data caption coding scheme adapted from previous studies by Boyland et al,[50] Kelly et al[114] and Gantz et al[115], was used to evaluate the recorded advertisements (Appendix 8). The food products advertised were coded according to their effect on general and dental health as well as potential for detrimental effects with orthodontic appliances.

All recordings were copied from a hard disk drive onto DVD discs for coding. All of the advertisements recorded were coded by the student researcher (DP) and also by a research supervisor (EB) for verification, using a coding data caption scheme on Microsoft Excel™ 2016 spreadsheet (appendix 9).

9.6.1.1 Programme name and type

For every advertisement the associated programme and type (genre) was recorded. However, as there were only 5 programme types included, the only genres were comedy, soap opera, and entertainment/variety.

9.6.1.2 Advertisement product type

Twenty-one categories were used to define the type of product that is being advertised as follows: Food and drink, Clothes/shoes, Education, Entertainment (including music, video, films, entertainment parks), Financial (including building societies, banks, insurance, pensions), Household cleaners/detergents (including washing up liquid, washing powders, cleaning fluids), Household equipment (including electrical appliances), Motoring (including cars and petrol), Pet products (including pet food), Pharmaceutical (including medications, vitamin pills, breath fresheners), Public information announcements/community service announcements (general), Public information announcements (sponsored by food companies), Publishing (including magazines, books, newspapers. Includes recipe books and cooking magazines), Retailing & mail order (including catalogues, other that supermarkets), Toiletries (including soap, hair shampoo, cosmetics, nappies, sanitary protection), Toys, Travel/transport/holidays, Utilities (including telephone, gas, electricity), Channel promotions (including promotions for the channel, other programs) and Other. In addition, there was also a category for dental health care products.

9.6.1.3 Further coding of food products

For all food advertisements, more detailed coding was then carried out, which included recording the food product brand name and detailed description in a free text box of the coding scheme (e.g. McDonalds Happy Meal- depicted as hamburger, bottled water and fruit bag but primarily sold as hamburger, fries and soft drink). A food code was also assigned to each food product based on 29 categories (see appendix 8), which break the foods down into

three main categories- core (healthy food), non-core (unhealthy food), or miscellaneous food (e.g. vitamins). A code for 'supermarkets non-specified food' (code 27) was included in the miscellaneous food category, even though it did not often code for foods, because supermarkets are primarily considered as food retailers despite them now typically selling wider range of household products and appliances. Where appropriate, results are presented with and without this food code included to allow for consideration of how this coding approach affects the results.

9.6.1.4 Health claims

If any health claims were made in the advertisement, they were recorded according to the following categories: low fat/fat free, sugar free, no added sugar/less sugar, low calorie/light, Low carbohydrate, organic, natural ingredients/all natural/no preservatives/nothing artificial, provides essential nutrients (Inc. protein, calcium, potassium, vitamins, antioxidants), whole grain/whole wheat, fibre or bran, heart healthy, low cholesterol, diet, baked and five a day. If more than one claim was used then the main one was used, and if there is more than one main claim then the first one mentioned was used.

9.6.1.5 Primary target

In order to determine the primary target that the advertisement is aimed at, various factors were used to aid the decision, such as the age of the actors in the advertisements and the nature of their appeal. Five categories were used to define the age range of the primary target - children and/ or teens; teens and adults; adults (20-64); older adults (65+); and all ages.[115] The primary target of each food advertisement was recorded in order to examine the

prevalence of advertisements aimed at young people, and to allow comparisons to be made between advertisements promoting items harmful to dental health and the age of the target audience.

9.6.1.6 Effect on dental health

The next three assessments were to examine the amount and nature of adverting for foods and beverages that, when consumed, would have an effect on dental health. The items were classified into cariogenic, acidogenic and possible anti-cariogenic and/or anti-erosive properties. The most dominant food product was coded if more than one product was shown. If equal attention is given to more than one product, then the first item show was coded.

Cariogenic food was defined by the amount of sugar it contained, and therefore its potential to cause dental caries. In order to objectively define the sugar value into categories, the British Food Standards Agency's (FSA) 'Traffic Light Signposting Scheme' was utilised (see appendix 7), which defines the appropriate levels of fat, saturated fat, sugar and sodium. The sugar content and therefore cariogenic potential was assessed with four levels: low sugar level (0.1 - ≤1.8 g/100g or 100ml), medium sugar level (1.9 – 9.0 g/100g or 100ml), high sugar level (9.1 – 32.5 g/100g or 100ml), and very high sugar level (≥32.6 g/100g or 100ml).[103]

Acidogenic foods and beverages were recorded based on erosive potential as follows: soft drinks (carbonated / cordial squashes), fresh fruit juices, fruit juice drinks, and fruit/acidic sweets.[98] Foods and beverages with anti-cariogenic and/or anit-erosive effects were also

coded as follows: milk, cheese, peanuts, sugar-free chewing gum, xylitol sweeteners and gum, tea (unsweetened) and non-specified foods (see appendix 8).[98]

9.6.1.7 Effect on orthodontic appliances

The mechanical detriment to orthodontic appliances was assessed with coding based on the following criteria: hard foods, chewy, sticky, crunchy. The hardness (and therefore potential for mechanical damage) of the food advertised was assessed as soft, medium, hard and very hard. Both the texture and hardness of the food advertised were determined the student researcher (DP), and later reviewed by a panel of researchers including an orthodontic consultant (NF, SH).

9.7 Statistical Considerations

For data analysis, the data caption scheme for coding TV advertisements on the Microsoft Excel™ 2016 spreadsheet was imported into a Statistical Package for the Social Sciences software (SPSS version 21.0, IBM Corporation, Armonk: NY). From this, descriptive statistics were used to express frequencies, percentages and confidence intervals (CI). Pearson's chi-squared test and Binary logistic regression analysis (to calculate odds ratios) were also used to investigate associations between advertisements for foods and beverages potentially harmful to dental health and/or orthodontic appliances and the other independent variables such as channel, programme category, health claims, primary target and broadcast time.

9.8 Television viewing habits questionnaire

In order to examine the television (TV) viewing habits of a young orthodontic cohort, the participants of part A of the study were given a short questionnaire to complete. The questionnaire can be found in appendix 3 and table 9.1 shows the questions asked. It should be noted however, that there is a very small sample size for this questionnaire (n=9). In addition, it was not validated as the purpose was to aid the semi-structured interviews in part A, in order to gain rich data and act as a guide for interview questioning.

Question	Options
How long do you usually watch live or catch up television for on a typical weekday?	Less than 1 hour / 2 hours / 3 hours / 4 hours / 5 hours / 6 hours or more
How long do you usually watch live or catch up television for on a typical weekend day?	Less than 1 hour / 2 hours / 3 hours / 4 hours / 5 hours / 6 hours or more
Please circle which of these meals you usually eat in front of the television on school days:	Breakfast / tea
Please circle the meals that you usually eat in front of the television on weekend days:	Breakfast / Lunch / Tea
Do you have a television in your bedroom?	Yes / No
Which three channels do you watch the most?	(Free text)

Table 9.1 Questions from the TV viewing habits questionnaire

Chapter 10: Results

10.1 Results overview

In total, the study sample consisted of 18.5 hours of programming, containing 709 advertisements for a large range of products, taken from the following broadcasters: Channel 4 (12.1%, n=86), E4 (13.5%, n= 96), and ITV (74.3%, n=527). There was an average of 88.6 (SD ±6.7) advertisements on each day recorded, and each day represented on average 12.5% (SD ±0.94) of the total advertisements assessed.

Overall, 48.4% (n=343) of advertisements were shown on a Friday, and 51.6% (n=366) were shown on Saturdays. Table 10.1 demonstrates the programmes that were associated with the advertisements analysed, as well as the broadcast time, weekday, duration, and frequency/ percentage of the total sample. The greatest frequency of advertising was associated with 'The Voice' at 33.7% (n=239), and the lowest frequency was 'The Simpsons' at 9.7% (n=69). Programme duration times ranged from 30 minutes to 90 minutes, and show times ranged from 18:00 to 20:30.

Programme	Showtime	Weekday	Duration (minutes)	Frequency	Percentage %
The Simpsons	18:00	Friday	30	69	9.7
Hollyoaks	19:00	Friday	30	113	15.9
Ninja Warriors	19:00	Saturday	60	127	17.9
Coronation Street (early)	19:30	Friday	30	89	12.6
The Voice	20:00	Saturday	90	239	33.7
Coronation Street (late)	20:30	Friday	30	72	10.2

Table 10.1: Programme demographics

Table 10.2 and figure 10.1 show that food and beverage products (referred to as just 'food' from this point) made up 20.3% of all advertisements (n=144), and were the most commonly advertised product after 'channel promotions' (26.2%, n=186). Channel promotions and food advertisements accounted for almost half of the sample (46.5% n=330). The 3rd most common product type was 'household equipment' (9.4%, n=67), and the least common product was 'Toys' (0.1%, n=1).

Dental health care products only made up 0.7% (n=5) of the advertisements. This comprised of four toothpastes (2 x Colgate Total Proof, Aquafresh, and Colgate expert white) and one advertisement for denture adhesive cream (Fixodent).

Product type	Frequency	Percentage %
Food & drink	144	20.3
Clothes/shoes	8	1.1
Education	0	0.0
Entertainment	34	4.8
Financial	34	4.8
Household cleaners/detergents	14	2.0
Household equipment	67	9.4
Motoring	36	5.1
Pet products	4	0.6
Pharmaceutical	9	1.3
Public information announcements	8	1.1
Public announcement (food sponsor)	0	0.0
Publishing	4	0.6
Retailing/ mail order	9	1.3
Toiletries	44	6.2
Toys	1	0.1
Travel / transport / holidays	30	4.2
Utilities	22	3.1
Channel promotions	186	26.2
Other	50	7.1
Dental health care products	5	0.7
Total:	**709**	**100**

Table 10.2: Advertised product type frequency and percentage

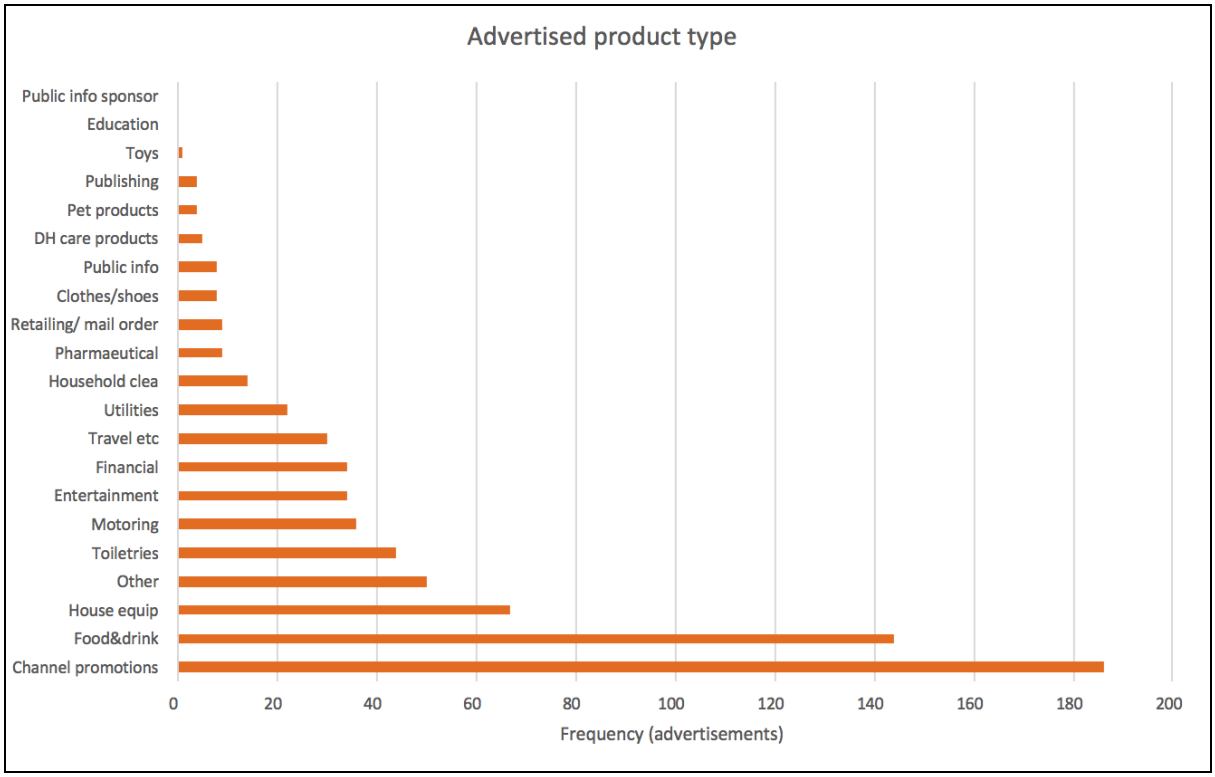


Figure 10.1: Bar chart of advertised product type

10.2 Frequency of advertisements based on general health effect

Table 10.3 and figure 10.2 demonstrate the proportion of core, non-core, and miscellaneous food advertising in the sample. The majority of food advertisements were for non-core foods (49.3%, n=71), mostly 'fast foods'. Miscellaneous advertising (30.6%, n=44) also made up a larger proportion of food advertisements than core foods (20.1%, n=29).

Food type	Frequency	Percentage %
Core	29	20.1
Non-core	71	49.3
Misc.	44	30.6
Total	**144**	**100**

Table 10.3: Advertisements for core, non-core, and miscellaneous foods

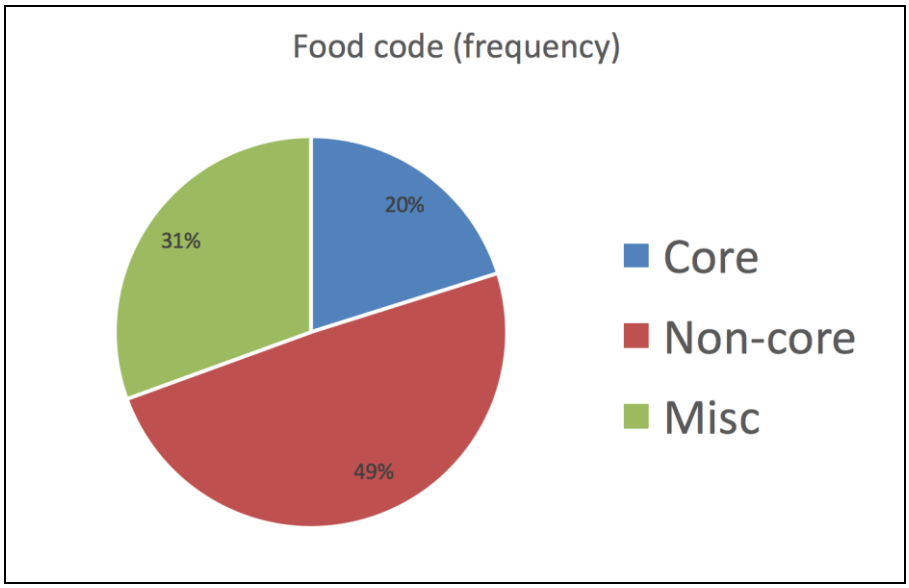


Figure 10.2: Proportion of core, non-core, and miscellaneous advertising

10.3 Food and beverage advertising

The food advertisements (see figure 10.3 & table 10.4) were shown before (29.9%, n=43) and during (70.1%, n=101) the programmes investigated. The most commonly advertised food category was 'Fast food' (23.6%, n=34). 'Chocolate and confectionery' was also frequently advertised, and was the 4th highest food group advertised at 6.9% (n=10).

There were frequent advertisements for supermarkets showcasing 'non-specific food', and this category was the second highest advertised (14.6%, n=21). There were advertisements for all the food codes except for some core foods such as 'breads, rice, pasta, noodles or low sugar breakfast cereals', as well as non-core item 'frozen/fried potato products' and miscellaneous item 'vitamins and minerals'.

The most common core food to be advertised was 'low fat milk, yogurt, custard, cheese and alternatives' (7.6%, n=11), this included items such as Danone yoghurt, Yakult, Alpro and Arla 'Lactofree' milks. The most common miscellaneous food was 'supermarkets non-specific food' (14.6%, n=21), which most frequently coded for DVD sales from supermarkets, as well as some non-food items such as flowers and vacuum cleaners etc.

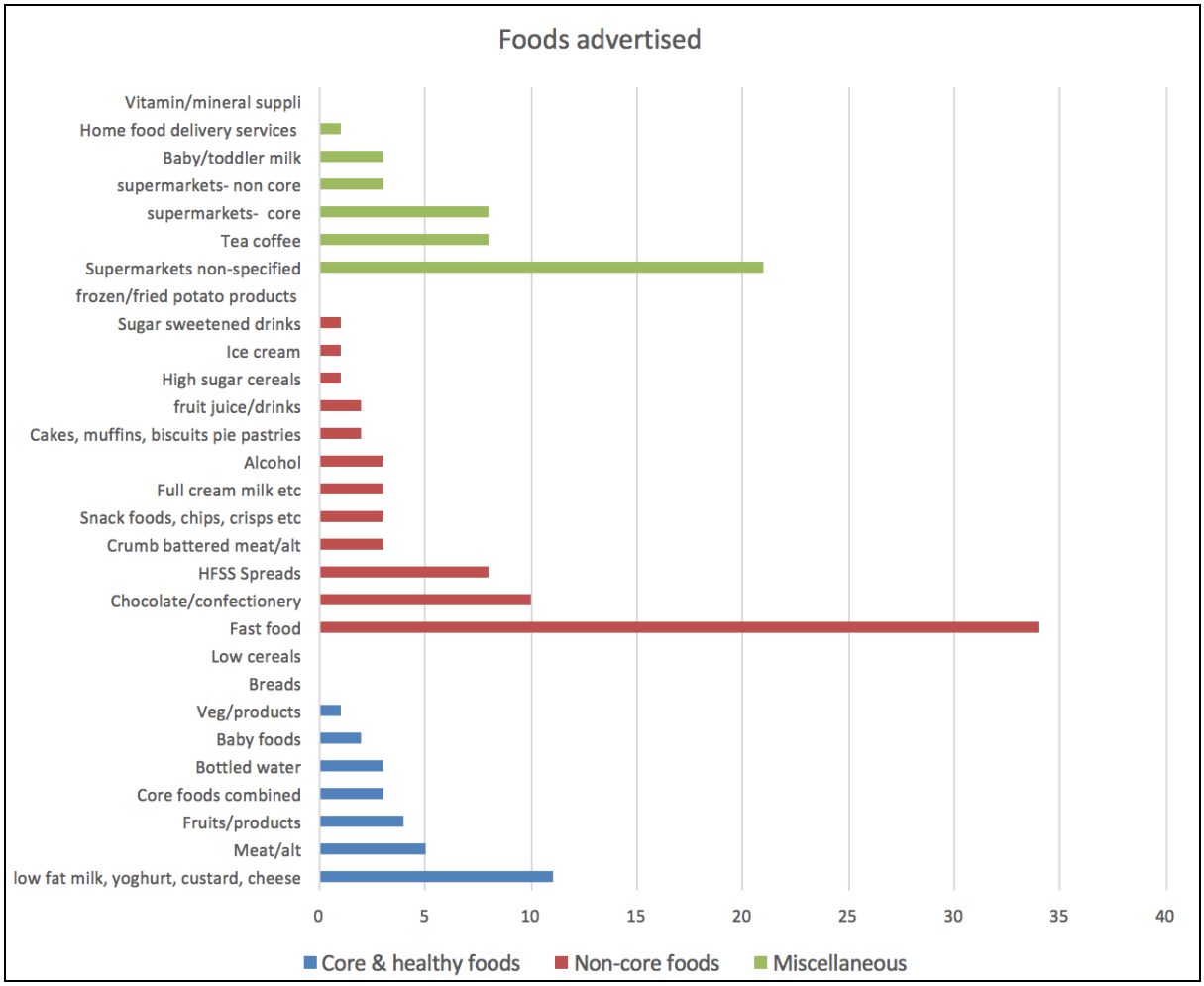


Figure 10.3: Bar chart of frequency of food and beverage advertisements

Food category	Frequency	Percentage %
CORE		
Breads, rice, pasta and noodles	0	0.0
Low sugar / high fibre breakfast cereals	0	0.0
Fruits / fruit products without added sugar	4	2.8
Veg / veg products without added sugar	1	0.7
low fat milk, yoghurt, custard, cheese and alternatives	11	7.6
Meat / meat alternative, eggs, nuts	5	3.5
Core foods combined, soups, sandwiches, mix salad	3	2.1
Baby foods (excluding milk formulae)	2	1.4
Bottled water	3	2.1
NON-CORE		
High sugar cereals	1	0.7
Crumb battered meat / meat alternative & high fat frozen meals	3	2.1
Cakes, muffins, biscuits, high fat pie / pastries	2	1.4
Snack foods, chips, crisps, popcorn, bars, sugar fruit/veg/nuts	3	2.1
fruit juice / fruit drinks	2	1.4
Frozen / fried potato products	0	0.0
Full cream milk, yoghurt, custard, dairy desserts, cheese	3	2.1
Ice cream / iced confection	1	0.7
Chocolate / confectionery	10	6.9
Fast food restaurant / meal	34	23.6
HFSS Spreads, oils, high fat sauces / meal helpers / soups	8	5.6
Sugar sweetened drinks	1	0.7
Alcohol	3	2.1
MISCELLANEOUS		
Vitamin / mineral supplements & sweeteners	0	0.0
Tea / coffee	8	5.6
supermarkets- non-core foods	3	2.1
supermarkets- core foods	8	5.6
Supermarkets non-specified food	21	14.6
Baby / toddler milk	3	2.1
Home food delivery services	1	0.7
Total:	**144**	**100**

Table 10.4: Frequency and percentage of food and beverage advertisements

10.4 Analysis of advertisements in regard to dental health

10.4.1 Cariogenic foods

Table 10.5 and figure 10.4 show the frequency of cariogenic foods advertised. In this category the most common code was ‘medium’ sugar level (27.1%, n=39), which even represented items less commonly associated with high sugar levels such as pizza/burgers, baby follow on milks, and garden peas; as well as items expected of this category such as ‘Weetabix On the go’ sugary breakfast replacements (7.3g sugar /100ml).

The next most frequent cariogenic code was ‘low’ sugar level (18.8%, n=27), which included foods such as battered bass fillets, mayonnaise and some pizzas. There were no advertisements for very high sugar content liquids, but there were ‘sticky’, ‘solid’ and ‘slow dissolving’ forms of very high sugar foods. ‘High’ level sugar foods included items such as ‘Innocent smoothie’ of varying flavours, and ‘Ben & Jerry’s ice cream’.

Some food items were found to be ‘non-specific’ (13.2%, n=19), ‘supermarket advertisements for non-foods’ (13.2%, n=19), and ‘zero sugar’ was found in 12.5% (n=18) of food advertising, which included foods such as coffee, butter, un-sweetened almond milk and bottled water.

Cariogenic food	Frequency	Percentage %
Low	27	18.8
Medium	39	27.1
High	7	4.9
Very high- Liquid	0	0.0
Very high- Slow dissolving	2	1.4
Very high- Solid	5	3.5
Very high- Sticky	8	5.6
Non-specific	19	13.2
Supermarket non-food	19	13.2
Supermarket dental healthcare product	0	0.0
Zero sugar	18	12.5
Total:	**144**	**100**

Table 10.5: Frequency and percentage of types of cariogenic foods advertised

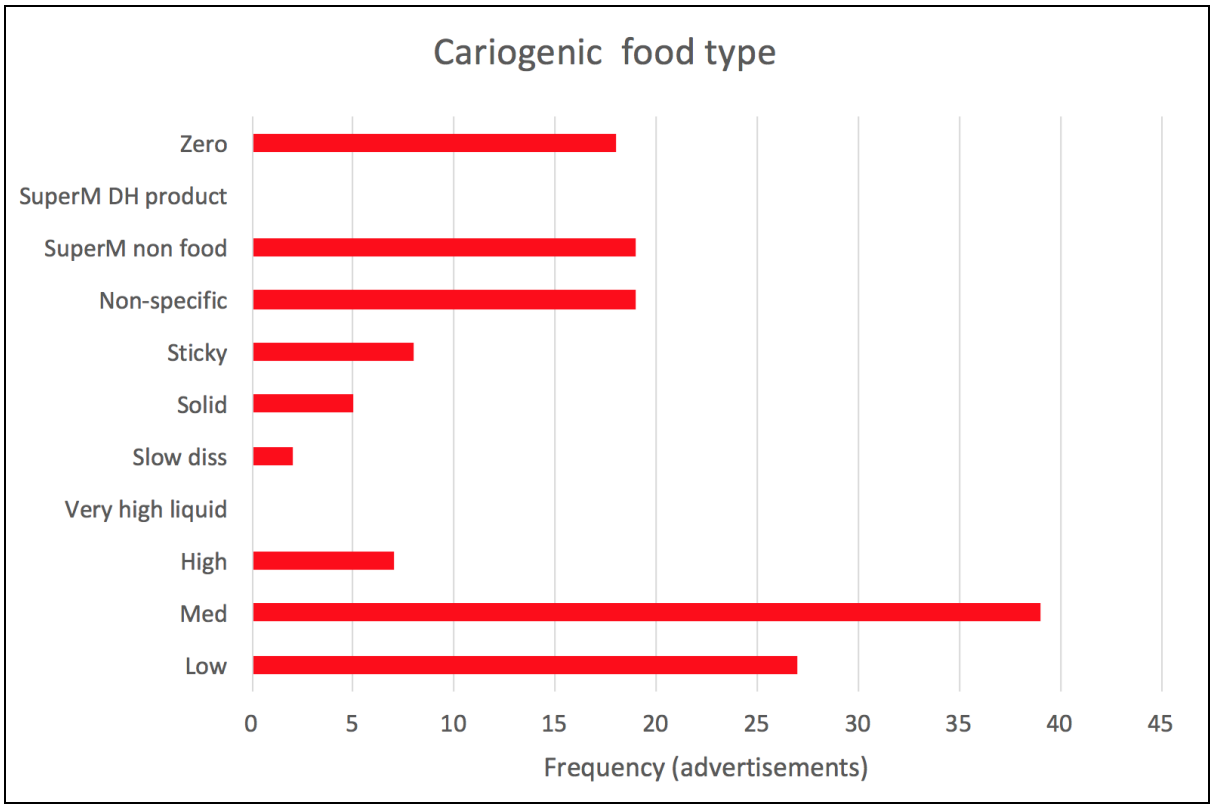


Figure 10.4: Frequency of cariogenic food types

The levels and types of sugars were further broken down by assessment of only sugar containing items and the results are shown in figures 10.5 and 10.6. Of the sugar containing foods advertised, the majority were considered to have a 'medium' level of sugar content (44.3%, n=39), followed by 'low' (30.7%, n=27), > 'very high' (17.0%, n=15), > 'high' (8.0%, n=7).

The most prevalent type of 'very high' sugar was 'sticky' (53.3%, n=8), > 'solid' (33.3%, n=5), > 'slow dissolving' (13.3%, n=2). There were no very high 'liquid' sugars in this sample.

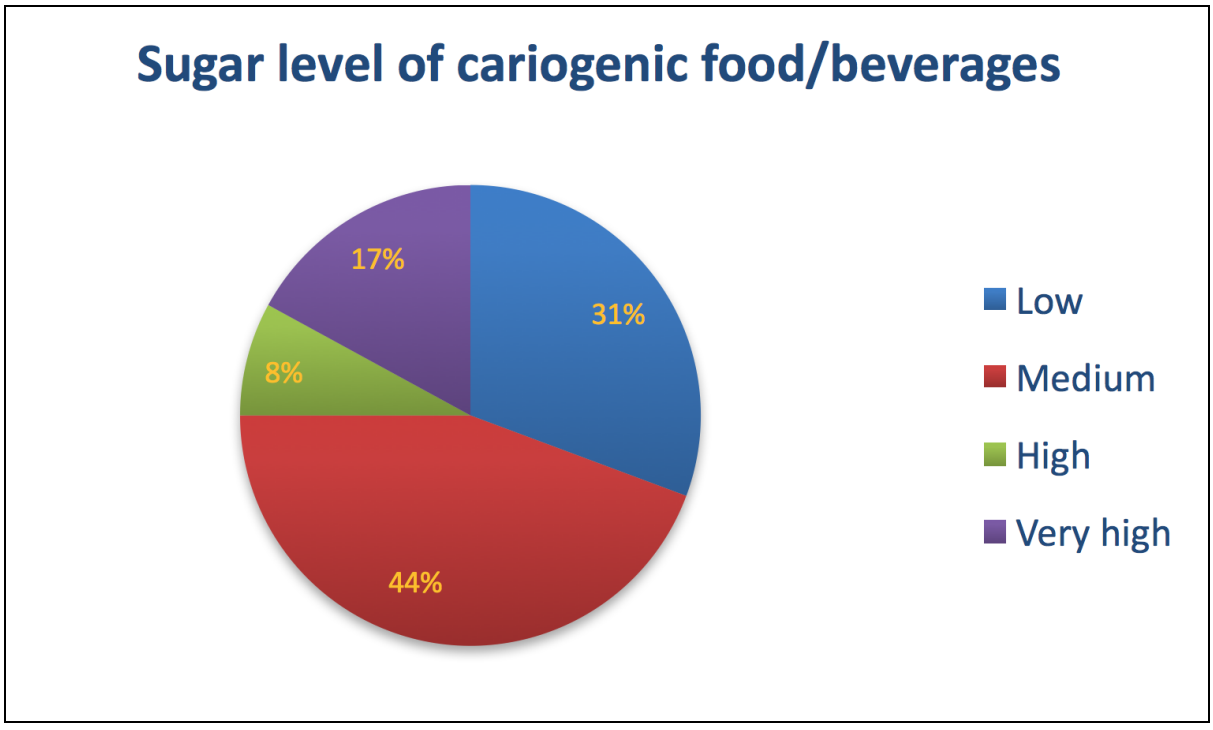


Figure 10.5: Sugar level of cariogenic food/beverages

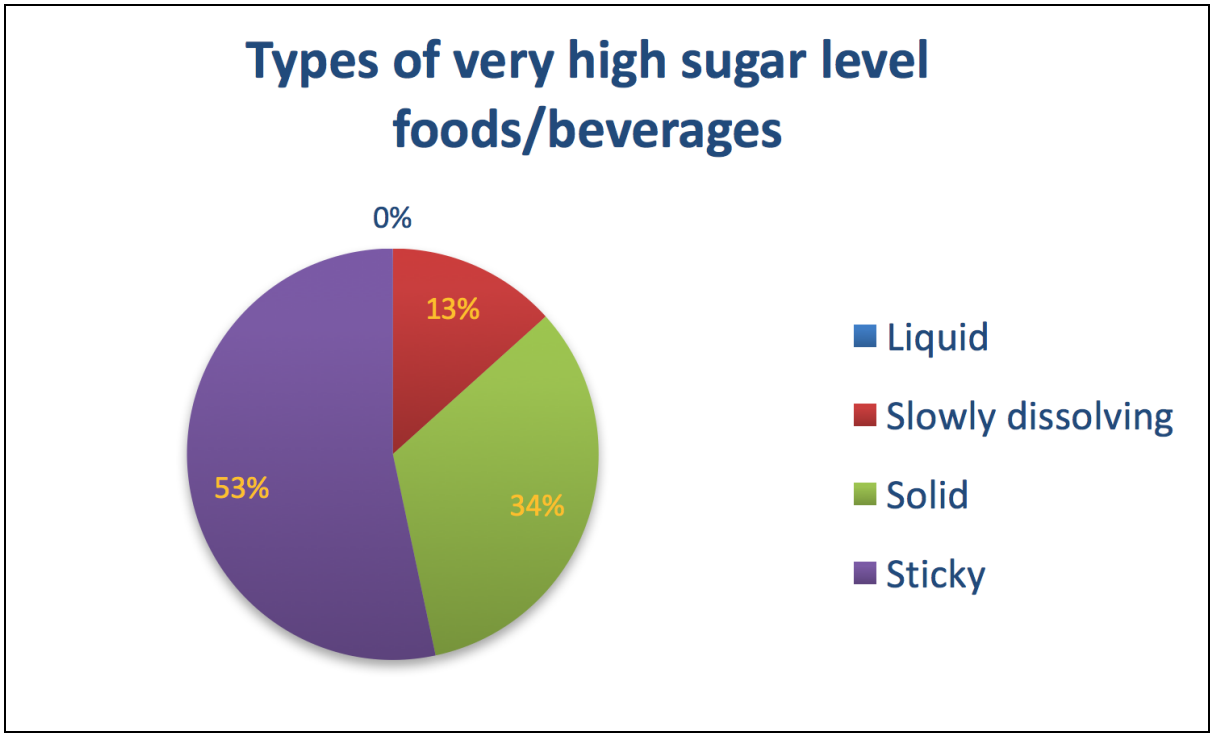


Figure 10.6: Types of very high sugar level foods/beverages

10.4.2 Acidogenic foods

The majority of food advertising was for foods considered to be 'non-erosive' (63.2%, n=91). There were no acidic foods found and 27.1% of advertisements were for 'non-specific' foods (n=20), or 'supermarket non-food' (n=19). Only 9.8% (n=14) of the food advertisements were considered to be acidogenic. Of these, the most frequent was 'soft drinks' (5.6%, n=8), > 'fresh fruit juice' (2.8%, n=4), > 'fruit / acidic sweets' (1.4%, n=2). These data can be seen in table 10.6 and figure 10.7.

Acidogenic food	Frequency	Percentage %
Non erosive	91	63.2
Soft drinks	8	5.6
Fresh fruit juice	4	2.8
Fruit / acidic sweets	2	1.4
Non-specific	20	13.9
Supermarket non-food	19	13.2
Supermarket dental health products	0	0.0
Acidic food	0	0.0
Total:	**144**	**100**

Table 10.6: Frequency / type of acidogenic foods advertised

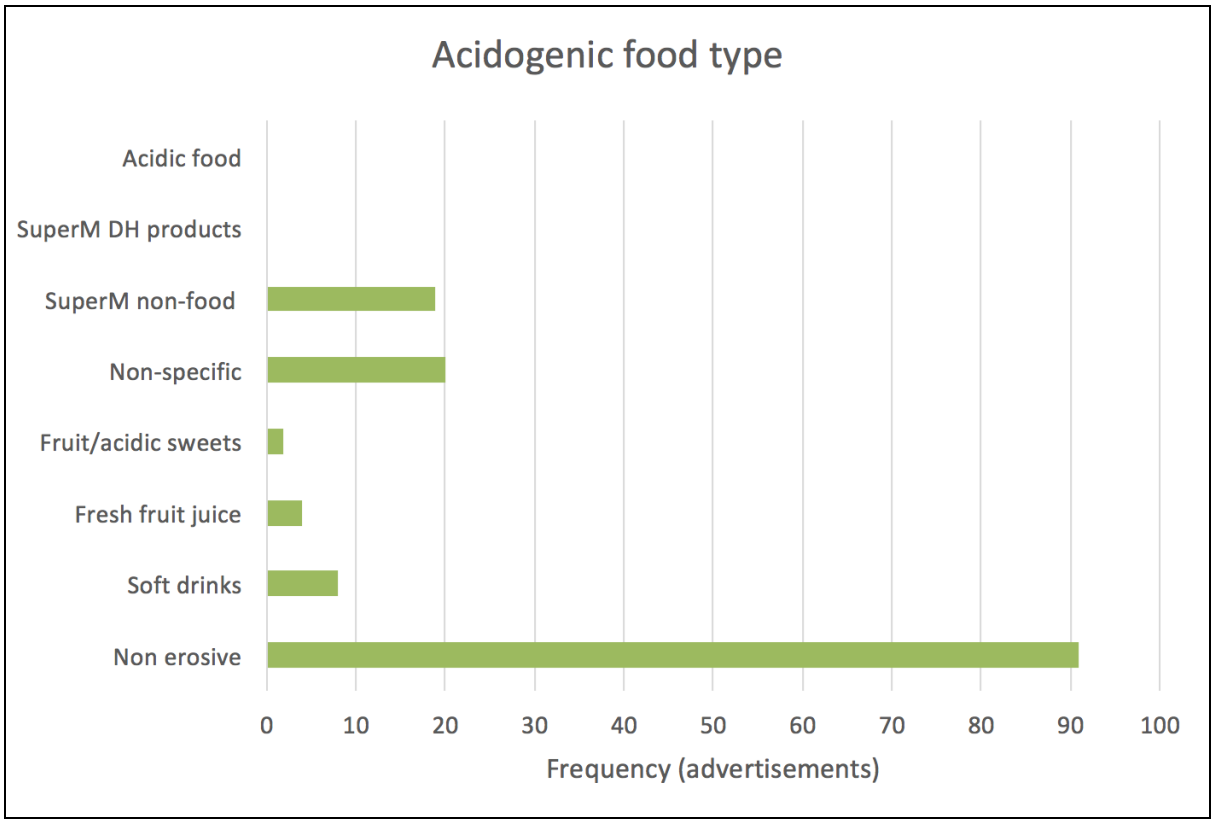


Figure 10.7: Frequency / type of acidogenic foods advertised

10.4.3 Extent of advertising for foods detrimental to dental health

An assessment was then carried out of the advertised foods that were detrimental to dental health. In order to define this category, advertised foods that were cariogenic, acidogenic, or both were considered to be harmful. Overall, 62% (n=89) of the 144 food advertisements were detrimental (harmful) to dental health (Figure 10.8). However, with the code for 'supermarkets non-specified' removed (n=21), the results show that 72.4% of food advertisements (now n=123) were detrimental to dental health.

Figure 10.9 also shows the proportions of harmful substances in the advertising, and it can be seen that 60% of the sample was cariogenic (n=87), 10% was acidogenic (n=14), and 8% was both cariogenic and acidogenic (n=12). Therefore, cariogenic food sources predominated the dental health detrimental foods category.

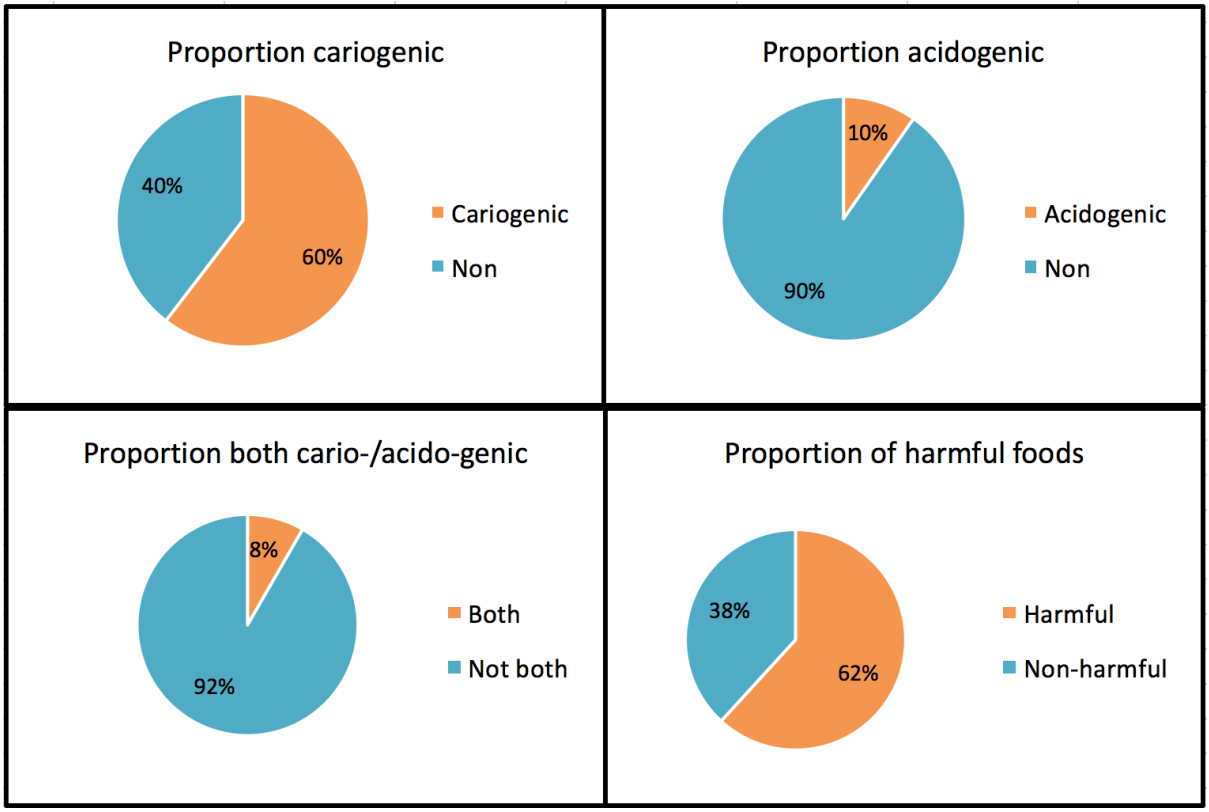


Figure 10.8: proportions of advertisements for cariogenic, acidogenic, and harmful to dental health foods.

10.4.4 Foods with possible anti-cariogenic &/or anti-erosive effect

There were very few foods advertised in this category (table 10.7 & figure 10.9) and the only foods found to have anti-cariogenic &/or anti-erosive effects, were 'milk' (6.9%, n=10), and 'cheese' (1.4%, n=2). There were no advertisements for 'peanuts', 'sugar-free gum', 'xylitol gum', 'tea (unsweetened), 'Sunny D Calcium' and 'supermarket dental healthcare products'. Supermarket advertisements for 'non-food' items made up 13.2% (n=19) of advertisements in this category.

Anti-cariogenic/anti-acidogenic food	Frequency	Percentage %
None	110	76.4
Milk	10	6.9
Cheese	2	1.4
Peanuts	0	0.0
Sugar-free gum	0	0.0
Xylitol gum	0	0.0
Tea (unsweetened)	0	0.0
Sunny D Calcium	0	0.0
Non-specified foods	3	2.1
Supermarket non-food	19	13.2
Supermarket dental healthcare products	0	0.0
Total:	**144**	**100**

Table 10.7: Prevalence of food with possible ant-cariogenic/erosive effect

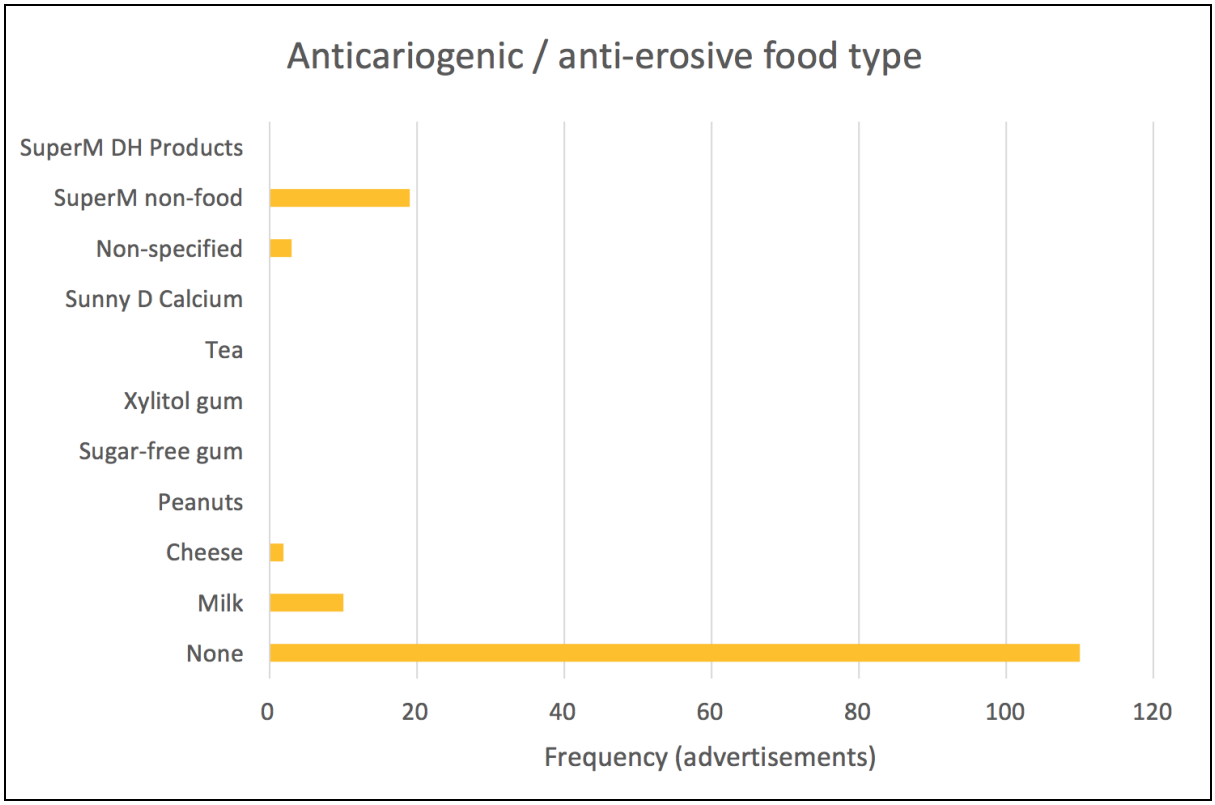


Figure 10.9: Prevalence of food with possible anti-cariogenic/anti-erosive effect

10.5 Analysis of advertisements in regard to orthodontic appliances

In order to assess how detrimental food advertisements could potentially be to orthodontic appliances, the sample was analysed in regard to two types of mechanical detriment to appliances. The type of 'mechanical detriment' to appliances was assessed based on food types: hard, sticky, 'chewy', and 'crunchy'. The 'detrimental level' of foods was assessed based on how hard the product was considered to be. This was decided by an orthodontic panel to reduce variation in the applied analysis.

10.5.1 Mechanical detriment to appliances

Overall, 35% (n=51) of food advertisements were considered to be mechanically detrimental to orthodontic fixed appliances. In summary this includes 15.3% 'crunchy' (n=22), > 7.6% 'chewy' (n=11), > 6.9% 'hard' (n=10), > 5.6% 'sticky' (n=8). Nearly 40% of food advertisements promoted products with no perceived detriment to orthodontic appliances (n=57) and a further 25% (n=36) were for non-specific foods. These data can be seen in table 10.8 and figure 10.10.

Mechanical detriment	No.	%
No detriment	57	39.6
Hard	10	6.9
Sticky	8	5.6
Chewy	11	7.6
Crunchy	22	15.3
Non-specific	36	25.0
Total:	**144**	**100.0**

Table 10.8 Frequency and percentage of items with mechanical detriment to appliances

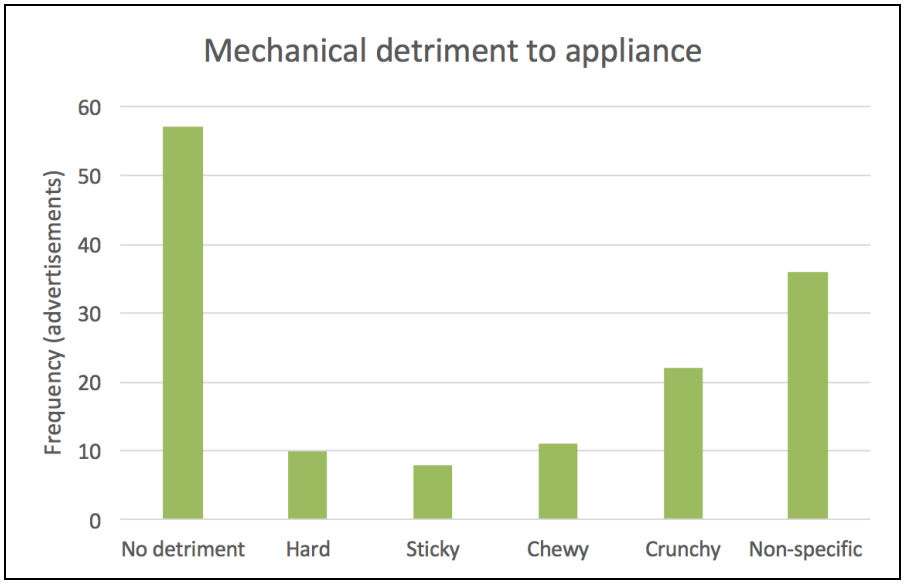


Figure 10.10 Frequency of food items with mechanical detriment to the appliance

10.5.2 Detrimental level (Hardness)

Table 10.9 shows that approximately 40% of food advertisements were for items considered to be soft. A rating of 'Hard' was the most frequent of the harmful categories of 'medium' (12.5%, n=18), 'hard' (20.1%, n=29), and 'very hard' (2.1%, n=3). This is also represented graphically in figure 10.11.

Detrimental level	No.	%
Soft	58	40.3
Medium	18	12.5
Hard	29	20.1
Very hard	3	2.1
Non-specific	36	25.0
Total:	**144**	**100.0**

Table 10.9 Frequency and percentage of detrimental level (hardness)

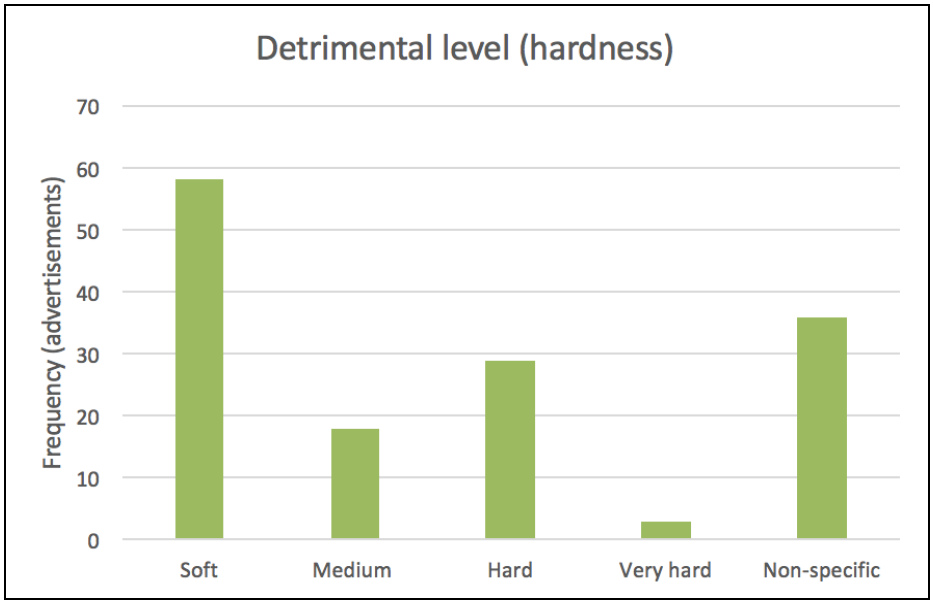


Figure 10.11 Frequency of detrimental levels of food advertisements

10.5.3 Overall detriment to appliances

Foods can be detrimental to patients with orthodontic appliances due to mechanical damage (due to hard foods), but also due to inducement of caries or erosion from cariogenic and acidogenic sources respectively. Therefore, food advertisements were also assessed for items which were damaging mechanically and/or damaging from a cariogenic/acidogenic standpoint. This assessment demonstrates the true prevalence of advertised items which are damaging, in any way, to patients with appliances.

In total, 64% (n=92) of all food advertisements were for items that were harmful to orthodontic appliances (fig 10.12). As discussed above, if advertisements for items classed as 'food', which did not actually describe or show any food (e.g. supermarket advertisemnts for DVDs) are removed, then a more worrying situation is highlighted, which shows that three quarters (74.8%) of food advertisements were harmful to appliances.

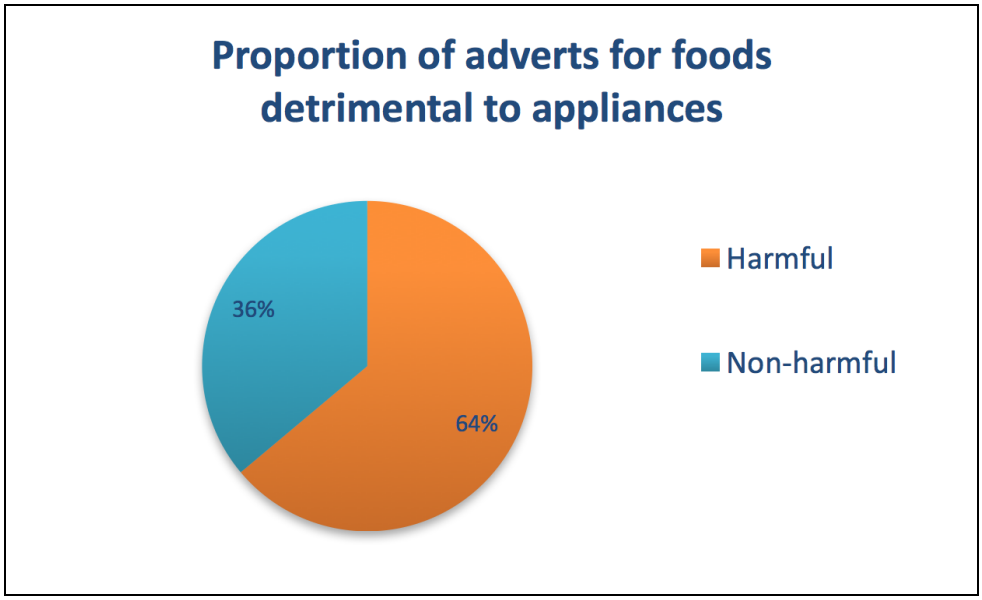


Figure 10.12 Overall proportion of adverts for foods detrimental to appliances

10.6 Flow chart of advertisement content analysis

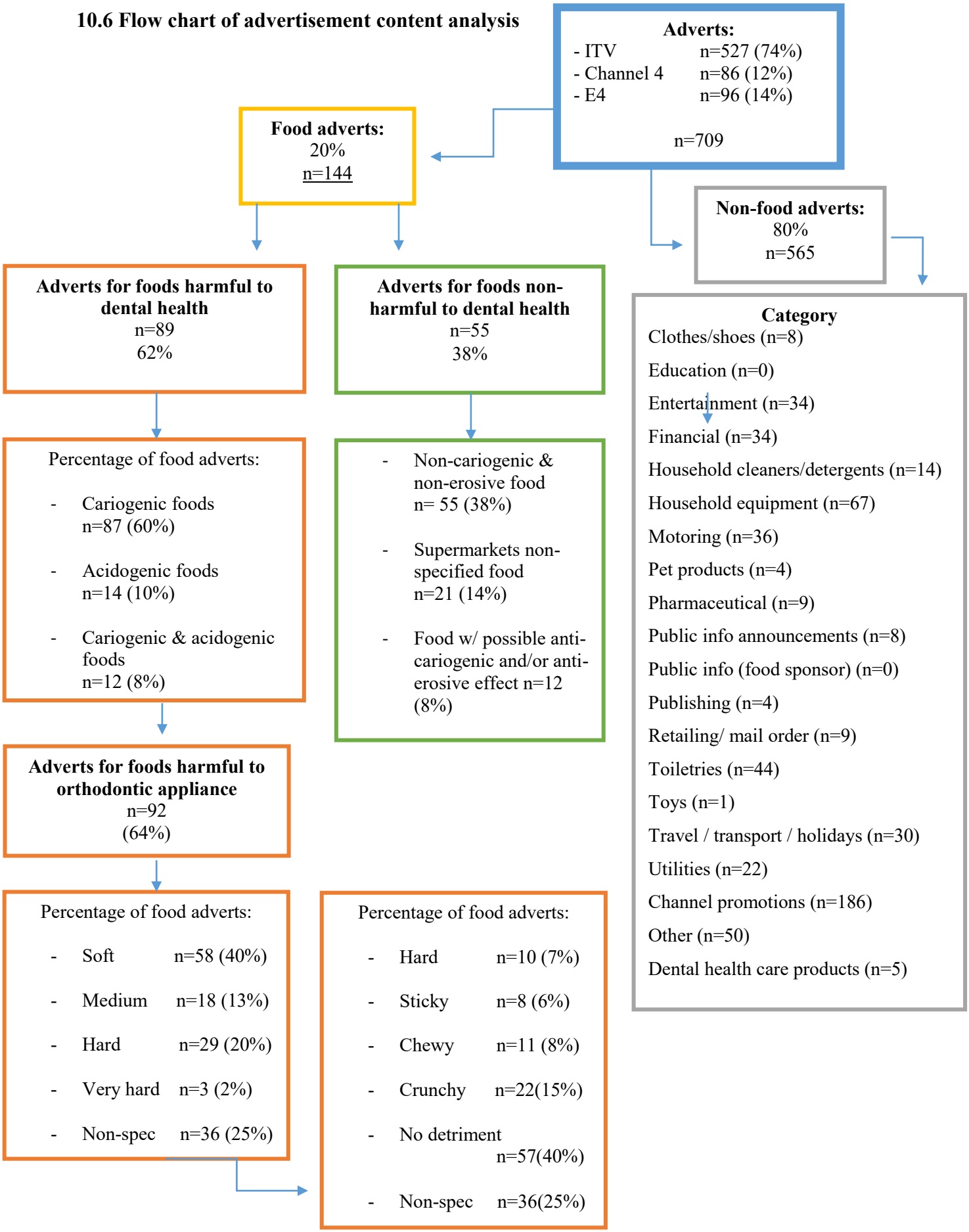


Figure 10.13: Flow chart of advertisement content analysis results

10.7 Channel variations

The vast majority of programming in this sample was broadcast on ITV (74.3%, n=527), in comparison with Channel 4 (12.1%, n=86), and E4 (13.5%, n=96) (table 10.10). This was likely to have also led to the fact that the majority of food advertisements were also shown on ITV (66.0%, n=95), compared with Channel 4 (11.1%, n=16), and E4 (22.9%, n=33).

However, there was not an equal proportion of food advertisements shown on each channel. In fact, the channel E4 was more likely to show food advertisements (34.4%), compared to ITV (18.0%), or Channel 4 (18.6%). Viewers watching E4 were 2.3 times more likely to encounter food advertisements, compared to Channel 4 viewers (OR 2.29 95% CI; 1.15-4.56, p=0.018).

	Frequency	Percentage %	No. food adverts	% food adverts	Proportion of food ads %
Channel 4	86	12.1	16	11.1	18.6
E4	96	13.5	33	22.9	34.4
ITV	527	74.3	95	66.0	18.0
Total	**709**	**100**	**144**	**100**	

Table 10.10 Variations in frequency, percentage and proportion of general advertisements and food advertisements per channel

Table 10.11 shows the frequency of advertisements shown that were detrimental to dental health, in comparison to the channel they were broadcast on. A Pearson Chi-Square test showed there to be a statistically significant difference between the channels, in terms of the number of advertisements broadcast that were for products potentially harmful to dental health ($\chi^2 = 11.976$, n=144, p=0.003). Advertisements for dentally harmful items were nearly 10 times higher on 'E4' compared to 'Channel 4' (OR 9.38 95% CI; 2.35-37.40, p=0.001).

Channel	Non-harmful	Harmful	Total
Channel4	12 (75%)	4 (25%)	16
E4	8 (24.2%)	25 (75.8%)	33
ITV	35 (36.8%)	60 (63.2%)	95
Total	55 (38.2%)	89 (61.8%)	144

Table 10.11 Proportion of advertisements for food potentially harmful to dental health by broadcast channel

10.8 Programme category

In this sample there were three programme categories: 'Comedy' (9.7%, n=69) which included The Simpsons, 'soap opera' (38.6%, n=274) which included Coronation Street and Hollyoaks, and 'Entertainment / variety' (51.6%, n=366) which included The Voice and Ninja Warriors (figure 10.14). When the items that were harmful to dental health were broken down into the programme category associated with the advertisement (table 10.12), the results revealed that there was a statistically significant difference between programme categories ($\chi^2 = 9.080$, n=144, p = 0.011) as follows, 'comedy' (23.1%), 'soap opera' (65.8%), and 'entertainment / variety' (65.5%).

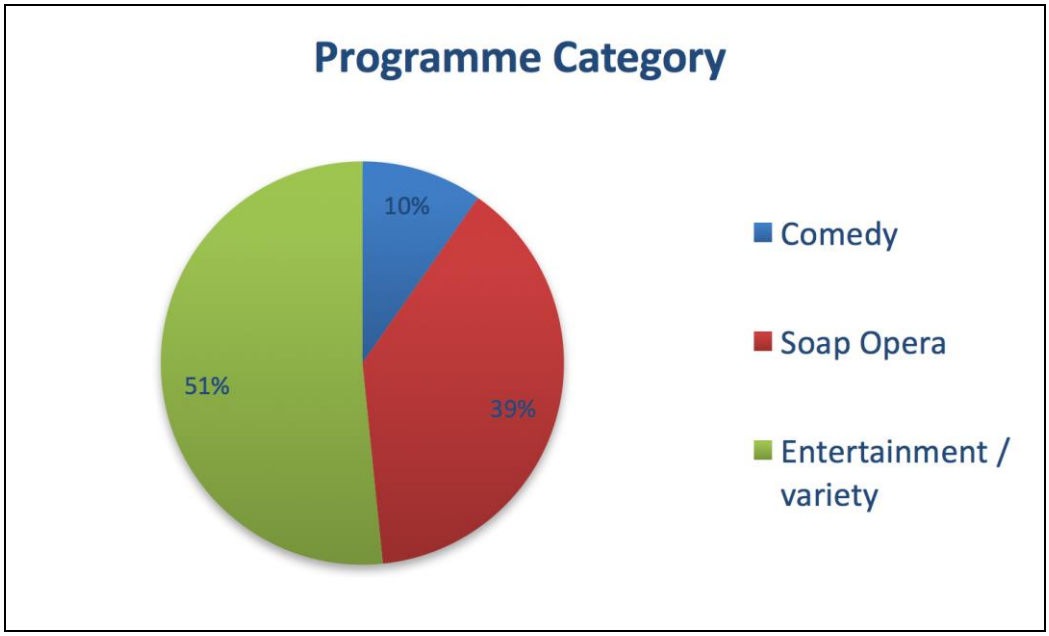


Figure 10.14 Proportions of programme categories analysed

Programme category	Non-harmful (Dental)	Harmful (Dental)	Total
Comedy	10 (76.9%)	3 (23.1%)	13
Soap Opera	25 (34.2%)	48 (65.8%)	73
Entertainment/ variety	20 (34.5%)	38 (65.5%)	58
Total	55 (38.2%)	89 (61.8%)	144

Table 10.12 Proportion of adverts for food potentially harmful to dental health by 'programme category'

10.9 Health claims

Table 10.13 & figure 10.15 show the frequency of health claims made by food advertisements in the sample. Nearly a fifth of all food advertisements contained some form of health claim (19.4%, n=28). The most frequent health claims were for items which contained 'natural, no preservatives &/or artificial ingredients' (4.2%, n=6), and 'nutrients' (4.2%, n=6).

Health claims	Frequency	% of claims	% of all food adverts
Low fat / fat free	5	17.9	3.5
Sugar free	1	3.6	0.7
No added sugar / less sugar	5	17.9	3.5
Low calorie / light	1	3.6	0.7
Low carbohydrate	0	0.0	0.0
Organic	0	0.0	0.0
Natural/ no preservatives / artificial ingredients	6	21.4	4.2
Nutrients	6	21.4	4.2
Whole grain / wheat	0	0.0	0.0
Fibre / bran	0	0.0	0.0
Heart healthy	0	0.0	0.0
Low cholesterol	0	0.0	0.0
Diet	0	0.0	0.0
Baked	0	0.0	0.0
Five a day	4	14.3	2.8
Total:	**28**	**100.0**	**19.4**

Table 10.13 Health claims associate with advertisements

Table 10.14 shows the proportion of advertisements with health claims, which also promoted items that were detrimental to dental health. The results show that 86.7% of advertisements with health claims were also considered to be potentially harmful to dental health. The association between advertisements with health claims, which were also detrimental to dental health was statistically significant ($\chi^2 = 9.922$, n=144, p=0.002) and further investigations revealed that advertisements with health claims included were over five times more likely to be for foods that are harmful to dental health (OR 5.26 95% CI; 1.73-16.06, p=0.004).

Health claim	Non-harmful (Dental)	Harmful (Dental)	Total
No	51 (44.7%)	63 (55.3%)	114
Yes	4 (13.3%)	26 (86.7%)	30
Total	55 (38.2%)	89 (61.8%)	144

Table 10.14 Proportion of advertisements for foods potentially harmful to dental health by 'health claim' status

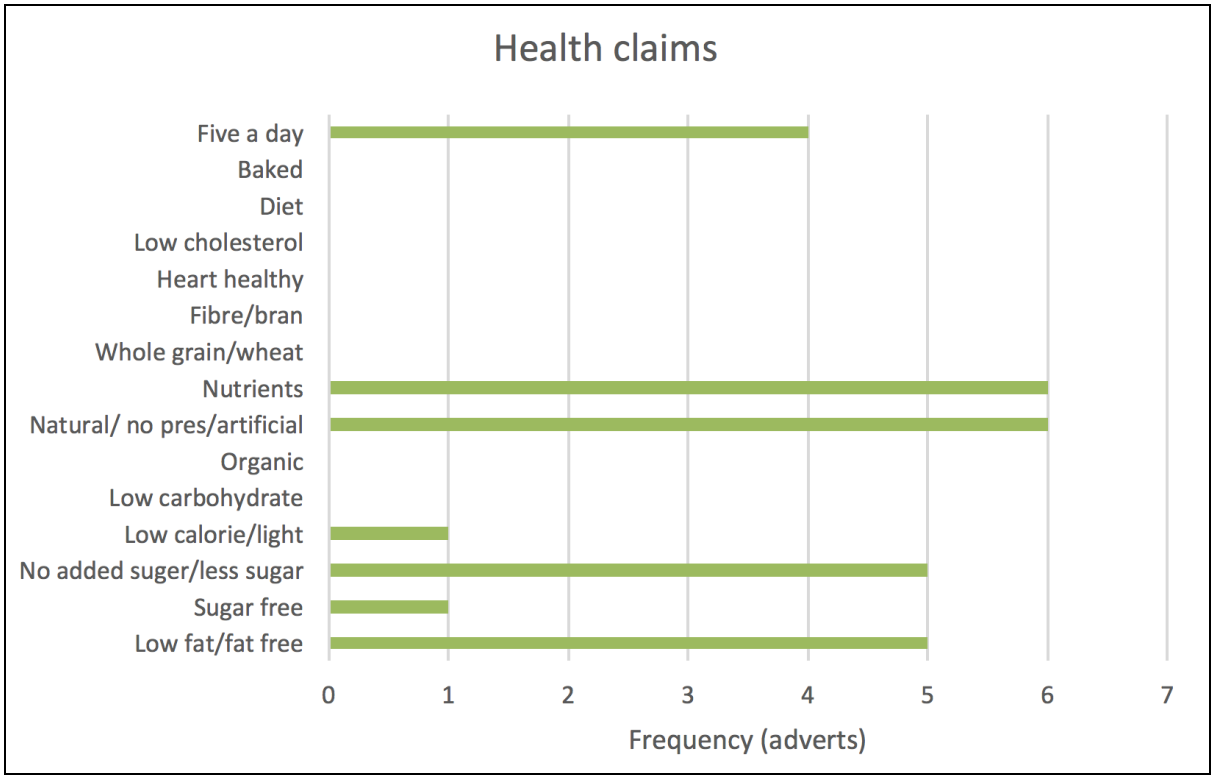


Figure 10.15 Health claims made by advertised products

10.10 Primary target

Table 10.4 and figure 10.16 show that in the sample investigated (shown on Friday and Saturday evenings), there were two major groups that appear to have been targeted; they were 'All ages' (51.4%, n=74), and 'Adults' (40.3%, n=58). The 'Children' and 'Teen' groups only made up 8.4% combined (n=12) and there were no advertisements aimed at 'older' groups.

Primary target	Frequency	Percentage %
Children	6	4.2
Teens	6	4.2
Adults	58	40.3
Older	0	0.0
All ages	74	51.4
Total:	**144**	**100**

Table 10.14 Primary target of advertisements

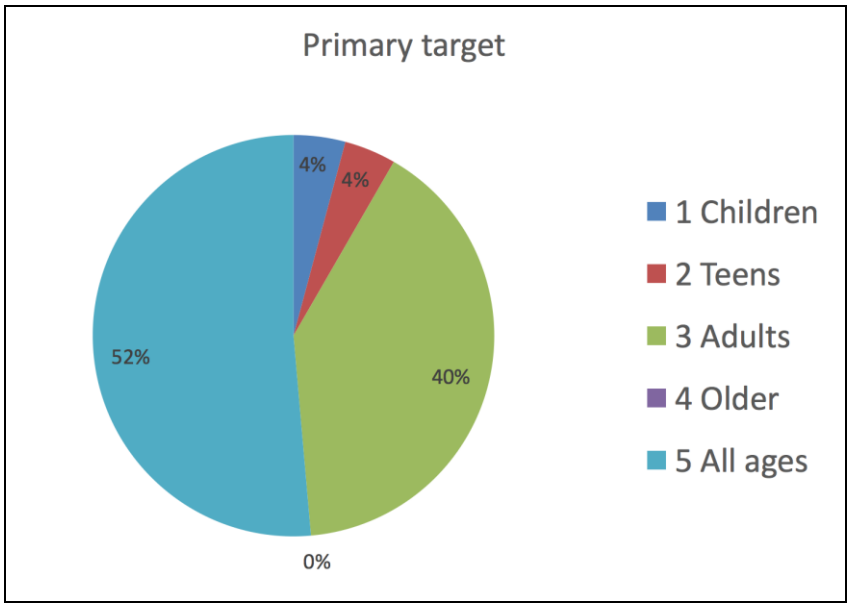


Figure 10.16 Pie chart of primary target of advertisements

Table 10.15 shows the proportion of food advertisements potentially harmful to dental health for each primary target. The percentages of each age range are shown and testing divulged that there was no statistically significant difference between groups (p=0.11). The table shows that 100% (n=6) of advertisements aimed at teenagers were for foods potentially harmful to dental health, however this finding has to be considered with great caution, as there were so few advertisements directly targeting this age group. This is also true of the

'children' group (n=6), who were the only group to have a higher proportion of food advertisements that were considered 'non-harmful' to dental health (66.7%), compared with 'harmful' food advertisements (33.3%).

Primary target	Non-harmful (Dental)	Harmful (Dental)	Total
Children	4 (66.7%)	2 (33.3%)	6
Teens	0 (0%)	6 (100%)	6
Adults	24 (41.4%)	34 (58.6%)	58
Older	0 (0%)	0 (0%)	0
All ages	27 (36.5%)	47 (63.5%)	74
Total	55 (38.2%)	89 (61.8%)	144

Table 10.15 proportion of advertisements for foods potentially harmful to dental health by 'primary target'

10.11 Comparison of advertisements by broadcast times

10.11.1 Friday vs Saturday broadcast times

Overall 59.7% (n=86) of food advertisements were shown on a Friday evening and 40.3% (n=58) of food advertisements were shown on a Saturday evening. Table 10.16 shows that on both days the proportion of advertisements for foods potentially harmful to dental health were approximately 60%, and so the groups were not significantly different ($\chi^2 = 0.567$, n=144, p=0.452).

Day	Non-harmful (Dental)	Harmful (Dental)	Total
Friday	35 (40.7%)	51 (59.3%)	86
Saturday	20 (34.5%)	38 (65.5%)	58
Total	55 (38.2%)	89 (61.8%)	144

Table 10.16 Proportion of advertisements for foods potentially harmful to dental health by 'day of the week'

10.11.2 Before vs during broadcast programme

An assessment was applied to all food advertisements based on the position, either before the associated programme, or during it. In total, 29.9% (n=42) of food advertisements were shown before programmes, and 70.1% (n=101) were shown during the programme. This was also compared with the items potential to cause harm to dental health and the results can be seen in table 10.17. Before programmes, 60.5% (n=26) of food advertisements were harmful, and during programmes, this value was 62.4% (n=63), which was not significant ($\chi^2 = 0.047$, n=144, p=0.829).

Position	Non-harmful (Dental)	Harmful (Dental)	Total
Before	17 (39.5%)	26 (60.5%)	43 (29.9%)
During	38 (37.6%)	63 (62.4%)	101 (70.1%)
Total	55 (38.2%)	89 (61.8%)	144

Table 10.17 Proportion of advertisements for foods potentially harmful to dental health by 'position of advertisement'

10.12 Television viewing questionnaire

As stated in the methodology section, questionnaires were included to aid with the part A semi-structured interviews process, however the results are included below for consideration. It should be noted that the questionnaire was not validated and based on a very small sample size (n=9).

10.12.1 Q1. How long do participants watch live or catch up TV for on a typical weekday?

Participants watched television for an average of 2 hours per day (SD 1.15) on a week day (mode = 2). In total, 4 participants watched less than 1 hour per day, 4 participants watched 2 hours a day and 2 participants watched 4 hours per day. Figure 10.17 represents these data graphically.

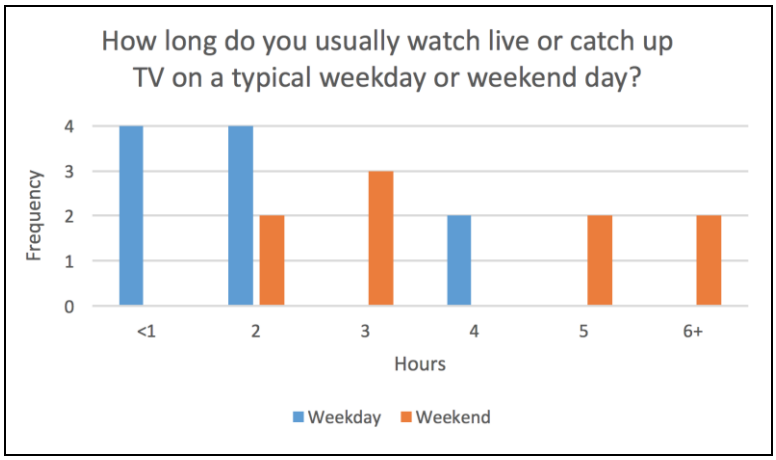


Figure 10.17 Duration (hours) of participant television viewing on week/weekend days

10.12.2 Q2. How long do participants watch live or catch up TV for on a typical weekend day?

Figure 10.17 also shows the amount of television that participants watched on weekend days, which averaged 3.6 hours per day (SD 1.78, mode = 3). In comparison with weekdays, participants watched almost twice as much television on weekend days, as can be seen in figure 10.17. This is to be expected as participants (aged 11-14 years-old) would not have attended school on weekend days.

10.12.3 Q3. Which meals do participants eat in front of the TV on school days?

In total, 50% of participants did not eat any meals in front of the television. 'Breakfast' was eaten in front of the television by 20% of participants on school days, and 30% for 'tea'. No participants ate both 'Breakfast' and 'Tea' in front of the television (figure 10.18).

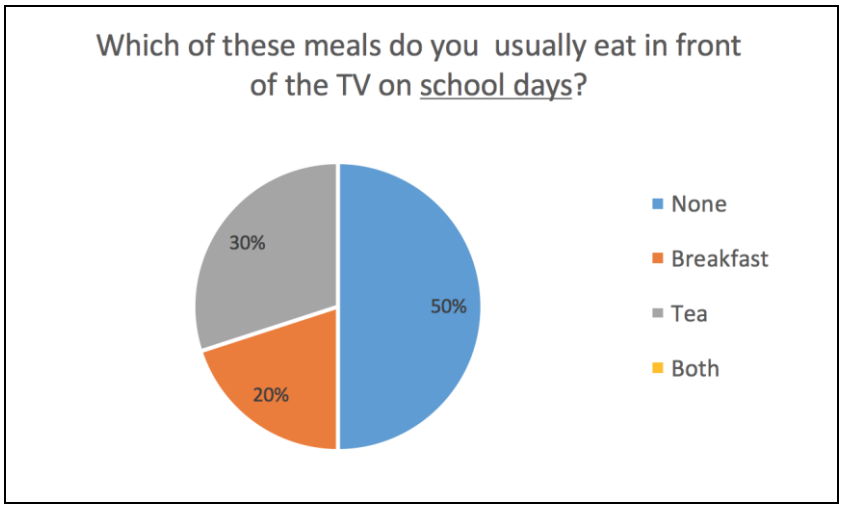


Figure 10.18 Proportion of meals eaten in front of the TV on school days

10.12.4 Q4. Which meals do participants eat in front of the TV on weekend days:

In this survey, only 8% of participants did not eat meals in front of the television on weekend days. The respective figure for other meals on weekends were ‘Breakfast’ 34%, ‘Lunch’ 25%, and ‘Tea’33% (figure 10.19). Only 2 participants ate more than one meal in front of the TV on a weekend day.

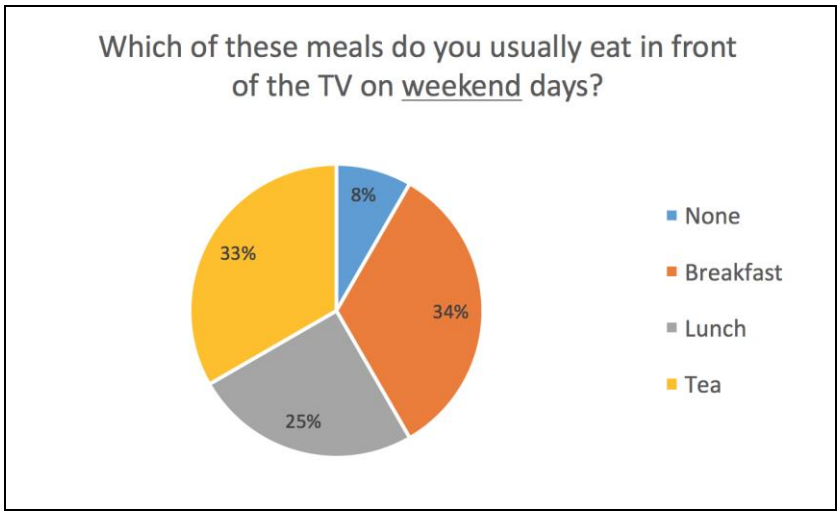


Figure 10.19 Proportion of meals eaten in front of the TV on weekend days

10.12.5 Q5. Do participants have a television in their bedroom?

In this sample (age group 11-14 years-old), the majority of participants had a television in their bedroom (70%).

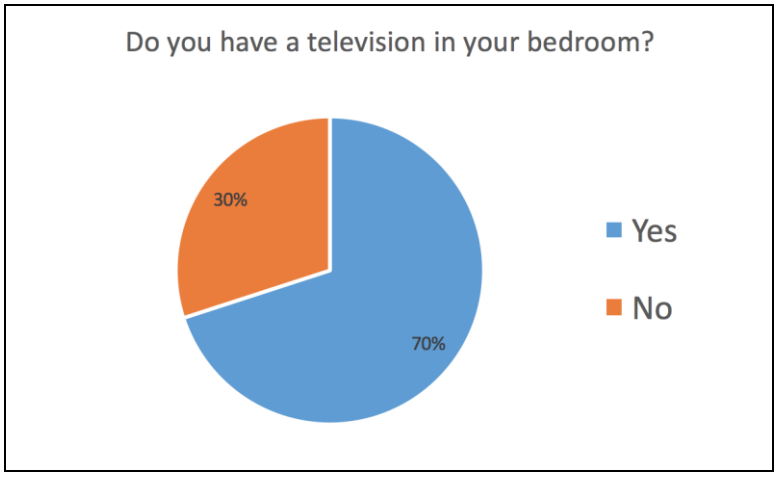


Figure 10.20 Proportion of participants with televisions in their bedrooms

10.12.6 Q6. Which three channels do you watch the most?

Figure 10.21 demonstrates that 'Netflix' was the most watched 'channel' by participants in this sample. 'Netflix' was in fact the only non-terrestrial (on-line) channel described by participants and far more popular than any terrestrial channels.

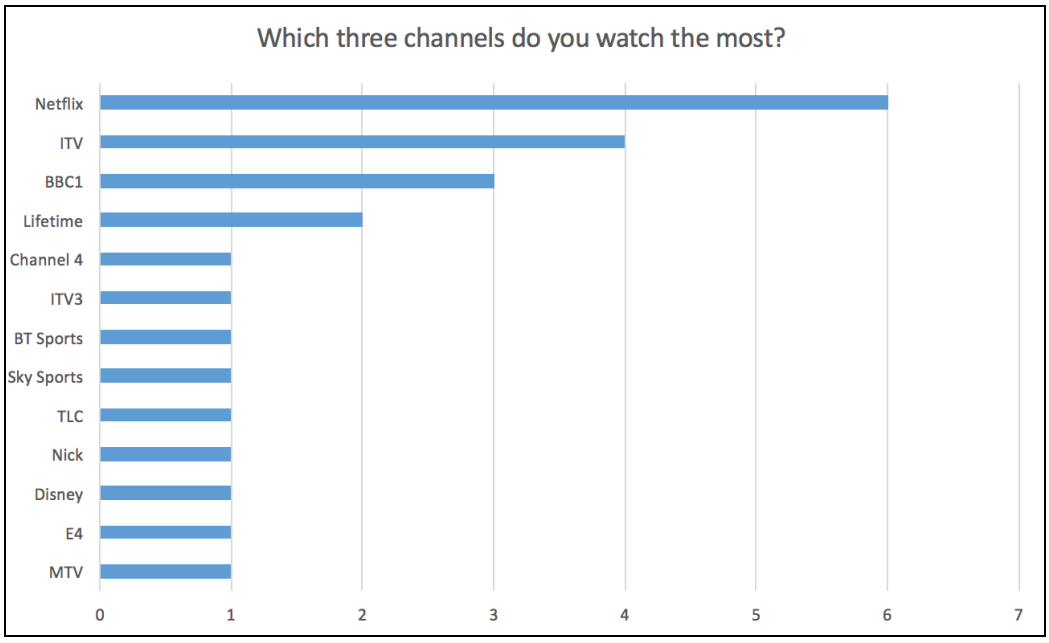


Figure 10.21 Frequency of participants '3 most watched channels'

10.13 Summary of the main findings

1. Food and beverage advertising accounted for approximately 20% of all advertisements assessed. This was the most frequent product type, excluding 'channel promotions'. Dental healthcare products represented only 0.7% of all advertising.

2. 'Fast food' was the most frequently advertised food item at 23.6%. Chocolate and confectionery' was the 4th most frequently advertised food item at 6.9%

3. In terms of general health effect, the highest proportion of food advertisements were for non-core foods (49.3%). Only 20.1% were for core foods and 30.6% were for 'miscellaneous' foods. If the codes for food advertisements which do not even show foods are removed (mostly supermarket advertisements for non-food items), then the majority of food advertisements (55%) were for items harmful to health.

4. In total, 62% of all food advertising was for items considered to be harmful to dental health (60% cariogenic, 10% acidogenic, and 8% both cariogenic and acidogenic). If adjustment is made to only include advertisements that showed food, then this figure rises to 72.4%.

5. Only 8% of advertised foods had possible anti-cariogenic &/or anti-erosive effects, and this included milks and cheeses.

6. In regard to orthodontic appliances, 35% of food advertisements were considered to be mechanically detrimental, most commonly due to ‘crunchy’ foods (15.3%). Soft foods comprised 40.3% and 25% was non-specific, leaving 34.7% of foods advertised as hard in some form (medium 12.5%, hard 20.1%, very hard 2.1%). Overall, 64% of food advertising was for products considered to be detrimental to orthodontic patients with fixed appliances (due to cariogenic, acidogenic, or mechanically detrimental products).

7. Channel variations – Viewers watching the E4 programmes were 2.3 times more likely to view food advertisements, compared with Channel 4 viewers (OR 2.29 95% CI; 1.15-4.56, p=0.018), as there was a greater proportion of food advertising on the E4 programmes assessed (34.4%), compared with ITV (18%) and Channel 4 programmes assessed (18.6%). In addition, advertisements for dentally harmful items were nearly 10 times higher on ‘E4’ programmes assessed, compared with ‘Channel 4’ programmes assessed (OR 9.38 95% CI; 2.35-37.40, p=0.001).

8. Programme category – Advertisements for foods that are harmful to dental health were statistically more likely (p=0.011) to be broadcast in association with ‘soap opera’ (65.8%) and ‘entertainment / variety’ (65.5%) categories, compared with ‘comedy’ (23.1%).

9. Health claims - Approximately 20% of all food advertisements contained some form of health claim. Interestingly, 86.7% of advertisements which made health claims were for products that are potentially harmful to dental health, and this association was statistically significant (p=0.002). In fact, food advertisements with health claims

were over five times more likely to be for foods that are harmful to dental health (OR 5.26 95% CI; 1.73-16.06, p=0.004).

10. Primary target – The majority of food advertisements were for 2 age groups: 'All ages' (51.4%), and 'Adults' (40.3%), which together represented 91.7%. There was no statistically significant association between age groups and dentally harmful food advertising (p=0.11), however 100% of food advertisements aimed at teens were for dentally harmful foods (however this was based on only 6 advertisements).

11. Broadcast times – With regards to dentally harmful food advertisements, there was no difference between advertisements shown on Friday and Saturday evenings (p=0.452), and before or during programmes (p=0.829).

12. A survey questionnaire of 11-14 year-olds revealed that more TV is viewed on weekends opposed to weekdays (3.6:2 hours), on school days 50% of participants did not watch any meal in front of the TV, however on weekend days 92% ate at least one meal in front of the TV, 70% of respondents have a TV in their room, and the most popular 'channel' in the sample was 'Netflix' (which is not a terrestrial channel).

Chapter 11: Discussion

The study results show that, food advertising (20.3%) was the second most commonly advertised category after 'Channel Promotions' (26.2%) and 'Fast Food' was the most frequently advertised food category (23.6%). Additionally, the majority of food advertising associated with peak family viewing television in the UK at the start of 2017 was for products that were harmful to dental health (62%) and to orthodontic appliances (64%), due to cariogenic, acidogenic and mechanically detrimental factors.

This is an important issue to consider as children in the UK are exposed to approximately 20,000 advertisements on TV per year[51] and a systematic review and meta-analysis of acute exposure to unhealthy food advertising has been shown to affect immediate consumption choices and volume, as well as affecting overall dietary patterns.[53] Importantly, this study also showed that additional intake is not compensated for, so that the advertisement induced intake contributes to overconsumption and therefore, over time, weight gain.

Further evidence of such harmful effects are provided via a study by Coon et al. (2001) who used multiple linear regression models to show that children exposed to higher levels of television ate fewer core foods such as fruits and vegetables, and ate more non-core foods such as pizzas, snack foods and sodas.[55] Additional evidence of possible harm is demonstrated by a randomised cross-over trial conducted by Norman et al. (2018), which showed that children (aged 7-12 years-old) ate an extra 356kJ after food advertising compared with non-food advertising.[116]

Ofcom believe that newly introduced regulation on advertisements around programmes of particular appeal to children under 16, has reduced their exposure to HFSS advertising by 37%,[70] however Boyland et al. (2011) stated that advertisers are still able to circumvent the regulations by advertising during programming that attracts children and adolescents, such as family viewing broadcasting e.g. entertainment and game shows.[50] In fact, there was an increase in UK advertising of unhealthy food items even at peak children's viewing times.[72]

This evidence resonates with the results of this study, which examined peak family viewing times and found a high proportion of HFSS food advertising. Al-Mazyad et al. (2017) also discussed their disappointment in the fact that despite good adherence to the regulations, children are still targeted by food markets via television advertisements during family viewing, with a high proportion of foods that are potentially harmful to dental health.[49] From these results it can be concluded that more needs to be done in terms of extending regulations regarding HFSS advertising, in order to safeguard children from exposure to these harmful influences. This could be improved by imposing a 9pm watershed for such advertisements and banning brands or companies which are synonymous with HFSS items from sponsoring prime time family TV shows.[8]

11.1 Proportion of advertisements for food and beverage products

The results of this study show that approximately 20% of televised advertisements were for food items and this reflects the majority of similar work in this area. Before the full implementation of the OfCom restrictions, several studies found a very similar proportion of food advertising. Morgan et al. (2009) analysed 503 hours of programming and concluded

16.4% of advertisements were for foods.[48] Kelly et al. (2010) investigated 11 countries (68,462 advertisements) and found a higher proportion of food advertisements at 11-29%, however the UK data, which was recorded until 2008 (before the full implementation of the regulations) showed that 18% of advertisements were for food.[114]

Boyland et al. (2011) found that 12.8% of advertisements were for food, however unlike this study, the sample was recorded between the initial application of the OfCom regulations and the full ban on HFSS advertising with children's channels on the 1st January 2009.[50] Again, even after the OfCom regulations, many studies found similar proportions of food advertising, such as Adams et al. (2012) describing 14.6% and Al-Mazyad et al. (2017) with 16.7% of all advertisements depicting food items.[49,72]

There may however, be some evidence that the proportion of food advertising has reduced over the last decade, as demonstrated by Lewis and Hill's 1998 content analysis study which concluded that 62.8% of advertisements on 4 UK channels were for food items.[117]

11.2 Prevalence and type of food and beverage advertising based on general health effect

In regard to general health, the most frequently advertised category was 'Non-core' foods at nearly 50% of all food advertisements. 'Core food' advertisements made up 20.1% and 'Miscellaneous' 30.6%. Again, similar values were found in the UK literature by Al-Mazyad et al. (2017) with a 'Non-core' proportion of food advertisements at 43.9%,[49] Adams et al. (2012) found 51.1% total,[72] and Boyland et al. (2011) reported 56%.[50] However, a higher

proportion of 'Non-core' food advertising was discovered by Kelly et al. (2010) at 67%, however this study was based on data from 11 countries around the world and was therefore subject to great variation.[114]

The high levels of 'Non-core' advertising shown reflects the market practice of predominantly promoting low nutrition foods.[56] Regrettably, such advertisements have a direct effect on children's nutritional knowledge, preferences, purchase behavior, consumption patterns and diet-related health.

11.3 Prevalence and type of food and beverage advertising based on dental health effect

In the study sample, 60% of the foods advertised were cariogenic, 10% acidogenic and 8% of items were a combination of both. This represents a much lower proportion of cariogenic items compared to Al-Mazyad et al. (2017), in which 89% of advertised foods were potentially cariogenic,[49] the proportion of acidogenic foods was 10% in this study, up from 3.4% in the Al-Mazyad data. This could be because the previous study assessed advertisements from weekday, as well as weekend days, over a year, whereas this study focused on peak family viewing times on weekend evenings, and the sample was recorded after the 'sugar tax' levy was announced, which could explain the reduction in cariogenic food promotions (see below).

Advertised foods with possible anti-cariogenic and/or anti-erosive effects were twice as common in the Al-Mazyad et al. (2017) study (16.6%), compared with this study sample (8%). The majority of advertising for such items were for dairy products, such as cheeses and

milk products, and it should be remembered that although such sources may aid dental healthcare, they may not be so positive from a general health point of view, as such items have been associated with an increased risk of coronary heart diseases and obesity.[118]

Morgan et al. (2009) reported that a large proportion (38.4%) of food advertisements in their sample were for items that are high in sugar content (also based on the FSA's classification of 'High-sugar' foods- 32.6g / 100g or ml)[48] and Rodd and Patel (2005) stated this figure to be 56.4%.[51] In our sample, only 15.3% of all food advertisements were for foods that had a high-sugar content. The reason for this reduction may be due to the food industry, especially producers of 'Sugar-sweetened beverages' (SSB), aiming to reduce the sugar content of products following the announcement of a new levy on SSB, in March 2016 by the UK's Chancellor of the Exchequer.[119]

The Government had previously ruled out a 'sugar tax', despite a seven-point recommendation from 'Action on Sugar' submitted to the Health Secretary that urged actions to achieve a reduction in added sugars in food by 40% by 2020.[120] However, a levy was introduced in the UK in April 2018, which had raised £153.8m by the end of October 2018 by taxing 24p per litre for drinks with more than 8g per 100ml, and 18p per litre for those containing 5-8g of sugar per 100ml.[119,121]

In addition, consumers are becoming more aware of high-sugar items and their link with diet-related diseases, as highlighted by a randomised control trial by Billich et al. (2018), which compared the use of different 'Front-of-pack' (FOP) labels to reduce the consumption of SSB. Compared with controls, FOP labels, especially graphic warnings, all significantly reduced the selection of SSB by participants.[122] This finding has implications for our study,

as it demonstrates that consumers are aware of the need to reduce HFSS foods (in this case high-sugar items), and that if they are made aware of HFSS levels in food items, they may be able to combat the influence of harmful advertising by choosing healthier options.

The argument for TV influence adversely affecting the oral health of children is strengthened by an experimental study by Gatou et al. (2016), which showed that exposure to food advertisements significantly reduced the selection of healthy foods, which may lead to a higher risk of dental disease.[59] This finding was also reported in a questionnaire-based study by Ghimire and Rao (2013), which analysed advertisements from the children's favorite channels and also conducted oral examinations. They found that cariogenic food promotions were popular on the channels investigated and that such advertisements may strongly influence the child's preferences and eating habits, leading to a higher prevalence of caries.[61]

11.4 Orthodontic factors related to televised advertisements for foods

As far as the authors are aware, this study is the only content analysis to investigate televised advertisements in regard to potential effects on orthodontic appliances. Advertised foods were considered to be harmful to orthodontic appliances if they had chemical (cariogenic/acidogenic) or mechanical (through physical damage/debonding) detriment to appliances and their wearers.

Overall, 35% of food advertisements were considered to be 'mechanically' detrimental to orthodontic fixed appliances, mostly due to 'crunchy' food items. This figure rises to 64% of

food advertisements for products potentially harmful to orthodontic appliances, when the effect of cariogenic/acidogenic sources were also considered.

This study shows that approximately two-thirds of food advertisements shown to potential orthodontic cohorts is likely to be for products that are harmful to orthodontic appliances. The sample was chosen to reflect the programming and therefore the advertisements that are likely to be viewed by adolescent patients during peak family view times. As with products potentially harmful to dental health, such advertisements are likely to influence the behaviour of orthodontic patients in a detrimental manner, with regard to dietary choices. However, there are currently no published reports we are aware of that have related televised food advertisements with orthodontic cohorts.

11.5 Associations with foods harmful to dental health

This study highlighted associations between advertisements for products harmful to dental health and the following factors:

Channel Variations – Compared with Channel 4 programmes, viewers of the E4 programmes assessed were over twice as likely to view food advertisements and advertisements for dentally harmful items were nearly 10 times higher. Channel 4 and E4 are both owned by 'Channel 4 Corporation (C4C), a publically-owned but commercially-funded, not-for-profit organisation. E4 is aimed at a younger audience and further evidence that C4C achieve this target audience can be found in the OfCom report into C4C's remit published in 2017.[123] Respondents stated that *"Channel 4 is a bit more grown up [than E4]."* (Leeds, 18-19,

female, E), and that *"E4 appeals to a younger audience. If you'd done this test with somebody in their fifties it would be totally different as well. But E4 appeals to people of our age."* (Dundee, 22, male, DE).

Therefore, the results of this study suggest that the food industry marketing, and unfortunately, in particular those which promote products harmful to dental health, focus their promotions on channels/programmes aimed at younger viewers, who incidentally are more likely to be part of an orthodontic cohort.

Programme Category – The results showed that 'soap opera' and 'entertainment / variety' categories had a higher incidence of advertising for products harmful to dental health compared with 'comedy' programming. This finding is in agreement with Boyland et al. (2011) who also found a significantly greater proportion of food advertising broadcast around soap operas (25.4%) and entertainment programmes (19.7%).[50] Our results also therefore suggest that programmes which are not covered by regulation, may still expose children to considerable amounts of HFSS advertising.

Health Claims – In advertisements with health claims, products that are potentially harmful to dental health were five times higher. This evidence would suggest that marketers use health-claims as a tactic to promote products to consumers, which are harmful to dental health. This strategy was also suggested by Morgan et al. (2009) who claimed that marketing tricks included using health-claims to promote confectionery, high-sugar foods and 'junk' food to children.[48] This finding demonstrates the importance of making patients and parents aware that food products may be labelled as 'health', but this may be misleading with regards to

both general health and dental health, and they should be conscious of this when making healthy food choices.

11.6 Television viewing questionnaire findings

The results of the TV viewing questionnaire revealed that in the small sample of 11-14 year-old respondents, TV was more frequently viewed and more meals were reported to be consumed in front of the TV, on weekends. This finding is as expected as participants would not attend school on weekend days, which would lead to a surplus of recreational time.

The questionnaire also showed that the most popular 'channel' in the sample was 'Netflix', which is not a terrestrial channel. This finding highlights a limitation of this study, whereby the results may no longer truly represent the 'real world' influences that children are currently faced with and this is discussed in the appropriate section below.

Interestingly, 70% of respondents reported having a TV in their bedroom, despite recent evidence to suggest that between 2007 and 2015 there has been a decline in the number of TV's, game consoles, DVD and Blu-ray players in children's bedrooms (5-15 years-old).[94] Over the same period there has been an increase in internet access in the bedroom (desktop, laptop, netbook based).[94]

Despite a decrease in TV in children's bedrooms over time, there has been no further decreases since 2014. The proportion of children with a TV in the bedroom increases with the child's age (3 to 4 year-olds 23%, 12 to 15 year-olds 60%), however 100% of 3-4 year-olds

and 99% of 5-15 year-olds have access to a TV somewhere at home.[94] Although the results of our study are in opposition to this survey, it must be remembered that these data were based on only 9 participants.

11.7 Strengths and Limitations

The strengths of this study are that it used a systematic longitudinal sampling method to investigate advertising content associated with family viewing programming (that may circumvent regulation), and is the only study as far as we are aware, to investigate televised advertising phenomenon from an orthodontic perspective. It provides an updated evaluation of food advertising practices in the UK following the full implementation of OfCom regulatory changes, while also assessing sugar contents in the lead up to a new sugar content levy.

However, this study had several limitations and biases:

- This sample only looked at food advertising on terrestrial channels, but new media platforms allow children to watch alternative services (>40% of children aged 5-15 years-old now watch on-demand TV content), and therefore we cannot be sure of the incidence of harmful food advertising children are now subject to, which may be different from terrestrial food advertising (see 'direction for future research' section). Regardless, the television is still the main device used to view television programmes (96%), compared with the next most common device (tablet computer 27%) and is the only media device regularly used by the majority of 5-15 year-olds.[94]

- Sample size - Only 18.5 hours were analysed producing 709 advertisements. This was quite small in comparison with other studies of this type, which ranged from Lewis and Hill (1998), which assessed 828 advertisements, up to Adams et al (2012), which assessed 288 channels producing 1,036,953 advertisements.

- As samples were taken from Friday and Saturday evenings, the results are not generalisable to other days of the week or programmes broadcast before 6pm.

- Inclusion criteria – Advertisements from before and during programming were assessed, but not samples from afterwards, which could have led to selection bias.

- Exclusion criteria - Programme sponsors were not included in the analysis due to their variable nature, however as most were for HFSS and foods harmful to dental health, the true population mean of children's exposure to food advertisements on television is likely to be underestimated.

- The study utilised a retrospective, observational (content analysis) methodology and therefore bias may have been introduced when selecting the recorded sample. A systematic sampling method was adopted in order to minimise bias, as samples were recorded from consecutive Friday and Saturday evenings, at the same broadcast times over a 4-week period. However, programmes and advertisements are of course subject to seasonal variation.

- The sample selected only investigated 3 terrestrial channels out of over 100 digital terrestrial television networks.

- Comparisons made with other studies in the literature should be viewed with caution as there was variation in the sample size, design, food codes and day/time/duration/channel sampled.

- The study methodology was purposefully simple and broad in order to generate an overall assessment of advertising patterns. However, this meant that finer details, such as associations with promotional characters etc, were not assessed.

- The TV viewing questionnaire used did not undergo a formal pilot to test for acceptability, validity, and reliability, which casts doubt over the robustness of the data.[124] For example, in coding the questionnaire, data may have been misinterpreted as the regional colloquialism is to call an evening meal 'tea', and a lunch meal 'dinner'. In addition, the sample size was very small (n=9), however as previously discussed this questionnaire was included in order to aid the conduction of interviews (part A), and not as a quantitative measure to draw solid conclusions from.

11.8 Clinical relevance of findings/ implications of results

This study demonstrates that food advertising is prevalent on UK television and the majority of advertisements were for products that were harmful to dental health and orthodontic appliances, as well as 'Non-core' HFSS foods. As such, patients and their families should be made aware of the harmful influences they will be subjected to on account of food industry marketing, and they should be educated to recognize that HFSS and cariogenic/acidogenic foods are not part of a normal diet, and are especially harmful to orthodontic patients.

With regard to advertisements for products that are harmful to dental health, there were significant differences between the programme channels, programme categories, and advertisements with and without health claims. Again, patients and parents should be advised certain channels and/or programmes will expose them to an increased frequency of harmful advertising for food items which do not contribute to a balanced diet. In particular, patients may not be aware that many of the products with health-claims reported on in this study were often in fact very harmful to dental health due to high sugar levels or acidogenic contents, as such sources may be consumed in excess by unsuspecting appliance wearers who are trying to comply with orthodontic/dental advice and maintain the appliance. Patients should be guided towards the appropriate advice, for instance the 'brace friendly recipes' found in the British Orthodontic Society's, 'Now let's cook' publication.[25]

In addition to previous studies, our results contribute an updated evaluation of food advertising practices in the UK following the full implementation of OfCom regulatory changes and an insight into potential changes to advertising of products high in sugars, at a time when SSB manufacturers adapted their products in anticipation of the new Government

levy or ‘sugar tax’. An example of the influence this is having on the food industry is that Britvic, the owner of Robinsons, has dropped their entire original range and now only manufacture a ‘no added sugar’ range.[125]

This trend has implications for dental healthcare as well as general health, as reduced consumption of sugar will decrease the prevalence of dental caries and periodontal disease. However, if reformulation of products takes place in order to reduce sugars below a particular level outlined by the nutrient profile model calculations, then marketers will be able to advertise their products to children. The implications of this phenomenon on dental health could be potentially extremely detrimental as the timing/frequency of sugar consumption has a larger effect on the carious process than the quantity.[126]

The evidence from this study suggests that there is adequate cause to call for further regulation of food advertising to reduce the UK public exposure (especially children) to HFSS food advertising on television. There should also be increased promotion of healthy dietary choices for children, in order to avoid negative sequelae such as childhood obesity, diabetes and dental caries.

11.9 Direction for future research

An investigation into other platforms/media devices would demonstrate the prevalence and type of food advertising that children are subject to, for instance with online/on-demand services. Indeed, a recent randomised trial by Coates et al. (2019) was the first to show that social media influencer food marketing increases food intake in children aged 9 to 11 years-old to a similar extent as televised advertisements.[127]

An OfCom report found that between 2010-2015, in children aged 3 to 15 years-old there was an increase in the use of tablet computers to watch television programmes and films.[94] In addition to such devices, the report found that 35% of children aged 5-15 have a smartphone. The likelihood of ownership increased with age and was more common among girls. Smartphone ownership in children aged 5-15 has increased every year between 2010 and 2015. Furthermore, 40% of children aged 5-15 owned their own tablet computer and this increased with age. The majority of 8 to 15-year-olds have 3 or more media devices of their own.[94]

The Australian cross-over RCT by Norman et al. (2018) randomised 7-12 year-olds into 2 groups that were exposed to food advertising and non-food advertising on different days: the first group were exposed to multiple media (TV and internet), and the second group were exposed to single media (TV only). The study found that children in the first group (with multiple media exposure) ate more snacks after food advertising days, than the non- food advertising days, which was not compensated for at lunch, leading to an extra 194kJ of food intake.

The authors also concluded that the children's ability to self-regulate their food intake was overridden by marketing effects, and this effect was worse when repeated over multiple media platforms (which more closely match the children's real world exposures). Work by Batra and Keller (2016) also suggested that when online and off-line media marketing are used together it can increase consumer behavioral responses by synergistic cross-effects.[128]

Chapter 12: Conclusions

The results of this content analysis study demonstrated that during peak family viewing times on selected UK television in winter 2017:

1) In total, 20% of all advertising was for food and beverage items.

2) Based on their effects on general health, food and beverage advertising was found to have the following proportions:

    a. Core/healthy foods accounted for 20% of food advertising

    b. Non-core/un-healthy foods accounted for 50% of food advertisements

    c. Miscellaneous foods contributed 30% of food advertisements

3) The majority (nearly two-thirds) of advertisements for foods and beverages were harmful to dental health and orthodontic appliance wear, (62% and 64% respectively). This included:

    a. Cariogenic foods - 60%

    b. Acidogenic foods – 10%

    c. Foods with benefits to oral health – 8%

d. Foods inappropriate for appliances (mechanically or chemically) - 64% (35% due to mechanical detriment alone)

4) The amount of advertising for dental healthcare products was <1% and comprised of mostly toothpaste advertisements.

5) Statistically significant differences in the prevalence of advertisements considered harmful to dental health, were found between the following factors: ‘Advertisement Channel’, ‘Programme Category’, and ‘Health Claims’.

Chapter 13: Overall conclusions

The application of fixed appliances is known to affect dietary intake through a number of factors including pain/discomfort associated with hard foods, ulceration of mucosal surfaces and dietary advice from the dental professional. There is a scarcity of research that has investigated how the patients adapt to fixed appliances over the course of their treatment.

The patients' perceptions of fixed orthodontic treatment discussed in this study can help us to better understand dietary changes. Further to previous studies, this project has provided an insight into how and why dietary intake is modified by fixed appliances, as well as describing how our patients feel about any dietary adaptions over time.

In addition, an updated content analysis of the foods advertised on UK television during peak family viewing hours has been provided. Worryingly this shows that 62% of foods advertised where harmful to dental health and 64% were detrimental to patients with fixed appliances, which is compounded by the fact that 20% of all advertisements were for food products. This emphasises the need to provide excellent dietary, as well as oral hygiene advice to all patients, in view of the negative dietary influences they are subject to by advertisements. Although children now view content via many new media platforms, there is no reason to believe that such advertising would be any less detrimental (as discussed above).

It is hoped that the results of this study will be used to aid patient education by describing more accurately the likely challenges they will be faced with and how to adapt to difficulties. This study highlights the importance of thoroughly making patients aware of the significant

commitments required if they are to undergo orthodontic treatment, and suggests that we place the onus of responsibility on the patient.

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Appendices

Appendix 1 – Initial interviw topic guides

Semi-structured interview topic guide

(Subject to change according to initial interview findings)

T1 (six week) interview:

- Introductions and explanation of research/ thank you
- Confirm participant confidentiality and anonymity in reports or publications
- What the interview will cover/length
- Confirm consent to participation and recording
- Explain I have never had braces so please don't worry about saying something obvious, it probably isn't obvious to me
- Small Qs- how long had brace? Getting used to it? What friends say?

Themes –

- **Previous diet**
  - What was your diet like before braces?
- **Changes**
  - What changes have you made to your diet, if any?
  - What things have made you change?
  - How do you feel about these changes?
  - Will you stick to these changes after the brace comes off?
  - Do you think your diet is healthier:
    - For your teeth?
    - For your general health?
- **Eating difficulty**
  - What issues have you had with eating foods?
  - What in particular e.g. chewing, sticking to brace?
  - Which foods are particularly difficult?
  - How does this influence your food choice?
  - How did you get around this?
  - Food trapping?
  - How do you feel about these foods now?
- **Mechanical difficulty**
  - In what way have you found it hard to chew your food?
- **Softer diet than normal?**
  - Can you clarify what you think of as 'soft' food?
  - Do you eat more of these foods now than before braces?

- **Embarrassment**
  - Can you tell me about any embarrassing events related to eating?

- **Pain/rubbing ulcers**
  - Describe any pain, discomfort or rubbing you've had?
  - How did this effect your eating?

- **Orthodontists advice**
  - What advice did you get from the orthodontist?
  - How difficult has it been to follow that advice?

- **Breakages**
  - How many times has your brace broken?
  - What do you think has caused this?
  - Do you think any breakages were the orthodontist's fault?

- **Influence of family/friends**
  - What do your family eat?
  - What do your friends eat?
  - How is your diet different to them?

- **Timing/frequency of meals (changes)**
  - How many times a day do you normally eat/drink? Has this changed?
  - Tell me about your daily routine? Where do meals fit in?

- **Home cooking vs outside foods**
  - Can you tell me about who cooks at home?
  - How do you feel about eating out?

- **Summarise then- Is there anything we haven't spoken about that you want to discuss?**
- **What advice would you give to someone else about to start braces?**

Thank you for your time.
Next diet diary will be sent out in post before your 6/12 appointment and next/last interview to be held then.

New themes: ….?

T2 Interview topic guide

Semi-structured interview topic guide- T2

(Subject to change according to initial interview findings)

T2 (six month) interview:

- Recap of research/explanation
- Confirm again participant confidentiality and anonymity/ Number
- Explain interview content
- Confirm consent to participation and recording
- Quick review of comments made about their diet in the previous interview/diet diary

Themes –

- **Changes to last interview**
    - Is there anything different about your diet since last visit? If so, what?
    - How have your views changed about food/drink?
    - Since having braces, what changes have you made to your diet, if any?
    - What things have made you change?
    - How do you feel about these changes?
    - Will you stick to these changes after the brace comes off?
    - Do you think your diet is healthier:
        - For your teeth?
        - For your general health?
    - How many times a day do you normally eat/drink? Has this changed?
    - How do you feel about eating out now?
- **Adaption**
    - Can you describe how you have learnt to bite/chew differently?
    - What advice would you give to someone with a new brace regarding food/drink?
    - Can you give me an example of ways you've had to adapt to your brace?

- Do you feel your diet now, is the same as or different to your family and friends?
- Since having braces, how long do you spend trying to eat?

- **Coping strategies**
  - How have you coped with your new brace?
  - What have you done to make your brace easier to wear?

  - Are you ever embarrassed while eating or drinking?
  - Does this change, depending on whether you are with your family or friends, or on your own?

  - Do you find it messy to eat ever?
  - Does your food every taste different?

- **Comfort**
  - Could you describe any discomfort you've had with your brace?
  - Did this affect your food choices or eating in any way?

  - What ways have you found around this?

- **Consumption of 'bad' foods**
  - Do you think you choose different types of foods now, e.g. do you consider if it is sticky etc. more than you used to? (Prompt other types if needed- hard/chewy)

- **Oral hygiene**
  - How has your brushing changed over the last six months?

- **Substitutes**
  - If you have found it difficult to eat certain foods, then have you tried to replace it with a different item or prepare it in a different way? E.g. mashing, boiling for longer, softer variant?

- **Sources of advice**
  - What advice have you been given regarding diet?
  - Where have you looked for advice?

- **Summarise then- is there anything we haven't spoken about that you think is important about your food/diet?**

Appendix 2 – Diet (food) diary

Participant Number_____

Week starting (DD/MM/YYYY): _____/_____/_____

Food diary no. (1 / 2 / 3) _____

FOOD DIARY

- Use this diary to record EVERYTHING you have to eat and drink.
- Record 2 weekdays and 1 weekend day in the same week.
- Please be as accurate as possible, and include the amounts and a description (e.g. a 35g bag of Walker's Ready Salted crisps, a medium apple, half a pint of fresh orange juice, a mug of tea with milk and one sugar etc).
- Try to fill this in as you go along, rather than relying on memory at the end of the day.

Example:

Time	What did you eat or drink?
8:00	*Bacon sandwich- 2 x bacon, 1 egg* *Orange juice 1 glass*
12:40	*Hamburger with ketchup* *Chips (medium size)* *Can coke x 1*
15:15	*Mars bar (1 bar)*

IRAS Project ID: 228664, Sponsor Ref: UoL001321

Appendix 3- TV Viewing Questionnaire

Questionnaire

Instructions:
Please think about the time you spend watching television when you answer these questions. Do not include time you spend watching DVDs or playing games that are connected to the TV.

1. How long do you usually watch live or catch up television for on a typical weekday? (please circle)

Less than 1 hour / 2 hours / 3 hours / 4 hours / 5 hours / 6 hours or more

2. How long do you usually watch television for on a typical weekend day? (please circle)

Less than 1 hour / 2 hours / 3 hours / 4 hours / 5 hours / 6 hours or more

3. Please circle which of these meals you usually eat in front of the television on school days:

Breakfast / Tea

4. Please circle the meals that you usually eat in front of the television on weekend days:

Breakfast / Lunch / Tea

5. Do you have a television in your bedroom?

Yes / No

6. Which three channels do you watch the most?

.....

.....

.....

Thank you very much for doing this questionnaire.
Please hand this sheet to your clinician or send it to:

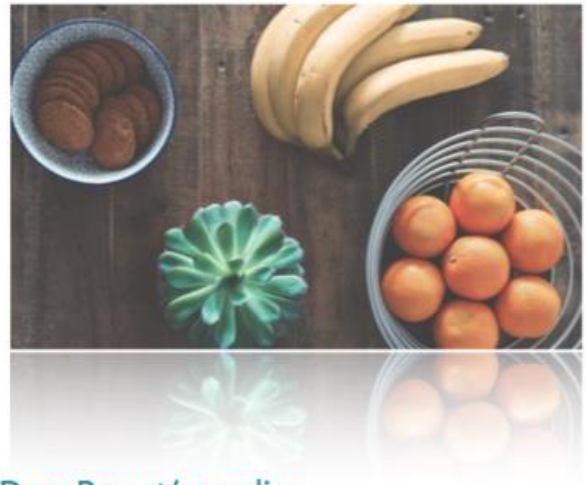
Dr D Palermo - University of Liverpool - Department of Orthodontics
Floor 2, Liverpool University Dental Hospital, Pembroke Place, Liverpool L3 5PS
Email: dpalermo@liverpool.ac.uk

IRAS Project ID: 228664, Sponsor Ref: UoL001321, REC Ref. 17/NW/0534
V_6_Nov_2017 Parental PIS

Appendix 4 – Participant information sheet

Participant Information Sheet

Alterations in dietary intake with fixed appliances and in relation to the influence of television advertising



Warrington and Halton Hospitals NHS Foundation Trust

The Royal Liverpool and Broadgreen University Hospitals NHS Trust

University of Liverpool

Dear Parent/guardian,

We would like to invite your child to take part in our study. Entry is entirely voluntary, but before they decide we would like to explain why the research is being carried out and what it will involve. Your child will be free to withdraw from the study at any time and they will not be disadvantaged by not participating. A member of our team will explain this information sheet to you and answer any questions you may have. You may want to take 5 to 10 minutes to read through the information sheet and feel free to discuss the matter with others if you wish.

Contents:

University of Liverpool - Department of Orthodontics
Floor 2, Liverpool University Dental Hospital, Pembroke Place, Liverpool L3 5PS
Email: dpalermo@liverpool.ac.uk
Tel: 0151 706 5068

14.11.17_V_6.1 Parental PIS. IRAS Project ID: 228664, Sponsor Ref: UoL001321, REC Ref. 17/NW/0534

1 STUDY PURPOSE

- Diet is a very important part of wearing braces (fixed appliances). An inappropriate diet can lead to white/yellow/brown marks on teeth (demineralisation), holes in teeth (caries), pain/soreness and breakages which lead to increased treatment times.
- Previous studies have shown that patients eat different things after having braces put on. However, they have not reported how the patients themselves feel that braces have changed their diet.
- In this study we want to see how braces affected your diet and what difficulties you had.
- We hope that this study will also show if there are any changes in patient's diets over time.

"Why are we inviting your child?"

As your child is about to undergo brace treatment, we are interested to hear their opinions of any changes they have to make to their diet, if any, and how they feel it may change in the future. Patients will be asked to participate if they are between 11-14 years old, medically fit and well without conditions that alter their diet, and with have braces on upper and lower teeth.

Participants well be recruited from Liverpool University Dental Hospital and Halton General Hospital. We aim to recruit 10 to 20 participants for this study.

2 WHATS INVOLVED

Involvement in this study is in addition to your child's orthodontic treatment. **No interventions/ experiments will be made in this study as it is purely observational.**

They will be asked to complete the following:

- **Food diary x 3-** We will ask your child to keep a 3-day food diary (see attached) of what they ate before having braces, roughly six weeks after having braces, and roughly six months into treatment. This is to show how braces have changed their diet.
- **Questionnaire-** There will be a very short questionnaire about TV viewing habits (see attached). There are six questions about their television viewing habits, which aim to understand the type/amount of exposure children have to televised food advertising. In a separate part of this study, televised advertisements for food products during peak family viewing times will be assessed to develop our understanding of potentially harmful influences on dietary behavior. However, your child will not need to be involved in this part of the study.
- **Meetings x 2-** Your child will be asked to attend two informal discussions, one after wearing their braces for roughly six weeks, and one after roughly six months. We will try to coincide the meetings with their usual review appointments. You should expect the meetings to last between 30-60 minutes. The meetings will be audio recorded and transcribed by an external organisation (with a non-disclosure agreement). The transcriptions will not have any identifiable data and the recordings will be destroyed after transcription.

Study details

The answers your child provides will not be shared with the dentists involved in their treatment and their information will be kept confidential. After your child's second meeting they will have finished their study involvement. Their study involvement will begin when they return their first diet diary and questionnaire. They will then hand in the second diet diary when they attend for the first meeting, which will be after 6 weeks of brace wear. The third diet diary is to be handed in at the second meeting, which will be after 6 months of brace wear.

Therefore, their study involvement will be approximately six months, however we only need to see them twice. Overall it should take no more than one year to see all the participants and complete the study.

No treatments will be withheld because of your child's study involvement.

After the study, if you wish to receive a summary of the research findings this can be arranged.

"What if we don't wish to carry on with the study?"

If your child wishes to withdraw from the study, we will destroy all their identifiable data, but would still like to use the anonymised data collected until withdrawal if you have no objections. If you prefer, your child's anonymised data can also be un-coded and destroyed, however after the results have been reported/published, this will no longer be possible. Your child's data will be handled, processed, stored and destroyed in accordance with the Caldicott Principles and more information can be found at the following URL: https://www.igt.hscic.gov.uk/Caldicott2Principles.aspx

"Will my child's feedback be made public?"

Your child's responses will be coded so that no one can identify them. If a particularly relevant comment is made on the feedback form, this may be included in any report, but they will not be identified and their name will not be included.

The research findings of this study are to be reported as part of a DDSc (Doctorate of Dental Science) project in orthodontics and will likely be submitted in an abraded manuscript for publication in a scientific journal. **Your child will not be identifiable from any report or publication placed in the public domain.**

"Are there any benefits to taking part?"

The data your child provides will be used to further the scientific evidence base available for their treatment and will benefit future groups of patients who undergo similar treatment.

"Are there any risks in taking part?"

No. This study only looks at your child's normal brace treatment and will not alter it in any way.

"Will my child's participation be kept confidential and their data secure?"

Yes. There will be no names listed in the research project reports. Your child's data will be stored in a secure area and destroyed after 10 years. To protect confidentiality all of your child's data will be anonymised and only the research team will have access.

Their details and the anonymisation code will be kept separate to the anonymised data and securely stored with the research coordinator. In addition to the information above, your child's name, date of birth, gender and contact details will be stored with the research coordinator. Only the research coordinator will have access to identifiable information.

The University of Liverpool will act as the data controller, responsible for the security and validity of your child's information held under the Data Protection Act. Our research coordinator will act as the data custodian and will manage access to identifiable data.

3 ADDITIONAL INFORMATION

Study sponsor, insurance and funding

This study is sponsored by the University of Liverpool (UoL). The University of Liverpool has vicarious liability for the actions of its staff, when through the course of their employment they are involved in the design and initiation of a clinical trial, including but not limited to the authorship of the Clinical Study Protocol. The University of Liverpool has appropriate insurance in place to cover this liability.

In terms of liability, NHS Trust and Non-Trust Hospitals have a duty of care to patients treated, whether or not the patient is taking part in a clinical trial, and they are legally liable for the negligent acts and omission of their employees. Compensation is therefore available in the event of clinical negligence being proven.

Clinical negligence is defined as:

"A breach of duty of care by members of the health care professions employed by NHS bodies or by others consequent on decisions or judgments made by members of those professions acting in their professional capacity in the course of their employment, and which are admitted as negligent by the employer or are determined as such through the legal process".

Funding for this study is to be provided by the University of Liverpool as part of a Doctorate in Dental Science (DDSc orthodontics). The study has been assessed by peer review from assessors at the University of Liverpool and there are no conflicts of interest to declare.

Ethics

All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given favourable opinion by the North West – Liverpool Central Research Ethics Committee (ref. 17/NW/0534).

Complaints

The University have a formal procedure to deal with complaints and for the reporting of adverse effects. If a participant or a participant's representative wishes to raise a concern about the study, and in particular about the conduct of the study or the individuals involved, that would be inappropriate to raise with the principal investigator (*Dr Daniel Palermo 0151, 706 5032)*, please use the complaints procedure.

Complaints should be addressed to the Research Governance Officer in Research and Business Services (ethics@liverpool.ac.uk, 0151 794 8727).

Please provide the identifying information below:

Principal Investigator:	Dr *Daniel Palermo*
Research Project Title:	*Alterations in dietary intake with fixed appliances and in relation to the influence of television advertising.*
Ethics Reference Number:	*17/NW/0534*

If you are happy for your child to enter the study please:

1) Sign the consent form attached

2) Ask your child to sign the assent form

3) Ask you child to complete the questionnaire

4) Complete the diet diary over the next few days and bring it to your next appointment




THANK YOU VERY MUCH FOR YOU TIME AND INTEREST IN THIS PROJECT.

Should you have any questions, please do not hesitate to contact us at:

Dr D Palermo
Orthodontic department (2nd floor)
Liverpool University Dental Hospital
Pembroke place, Liverpool, L3 5PS
dpalermo@liverpool.ac.uk
Tel: 0151 706 5068

Participant Information Sheet- child

Alterations in dietary intake with fixed appliances and in relation to the influence of television advertising

Warrington and Halton Hospitals NHS Foundation Trust

The Royal Liverpool and Broadgreen University Hospitals NHS Trust

UNIVERSITY OF LIVERPOOL

Dear Participant,

Many thanks for taking the time to read this Information Sheet. We are interested in how braces affect our patient's diets and therefore would like to ask you to take part in this project. After reading the Information below, please feel free to ask us if you would like more information or if there is anything that you do not understand. You do not have to take part in this research and you will not be disadvantaged should you decide not to participate.

Contents:

University of Liverpool - Department of Orthodontics
Floor 2, Liverpool University Dental Hospital, Pembroke Place, Liverpool L3 5PS
Email: dpalermo@liverpool.ac.uk
Tel: 0151 706 5068

14.11.17_V_6.1 Child PIS. IRAS Project ID: 228664, Sponsor Ref: UoL001321, REC Ref. 17/NW/0534

1 STUDY PURPOSE

- Previous studies have shown that patients eat different things after having braces put on. However, they have not reported how the patients themselves feel that braces have changed their diet.
- In this study we want to see how braces affected your diet and what difficulties you had.
- We hope that this study will also show if there are any changes in patient's diets over time.

"Why are we inviting you?"

As a new patient about to undergo brace treatment (fixed appliance), we are interested to hear your opinions of any changes you have to make to your diet, if any, and how you feel you might change in the future.

"Do I have to take part?"

Although we would greatly appreciate your participation, it is entirely voluntary. You will be free to withdraw from the study at any time and you will not be disadvantaged by not participating.

2 WHATS INVOLVED

"What will happen if I take part?"

- We will ask you to keep a 3-day **food diary three times**, once before you have braces, roughly six weeks after having braces, and roughly six months into treatment. This is to show how braces have changed your diet.
- As part of the first food diary only, there will be a very short **questionnaire** about TV viewing habits.
- You will be asked to attend **two informal discussions**, one after wearing your braces for roughly six weeks, and one after roughly six months.
- The answers you provide will not be shared with the dentists involved in your treatment and your information will be kept confidential.

3 ADDITIONAL INFORMATION

"Will my feedback be made public?"

Your responses will be coded so that no one can identify you. If a particularly relevant comment is made on the feedback form, this may be included in any report, but you will not be identified and your name will not be included.

"Are there any benefits to taking part?"

The data you provide will be used to further the scientific evidence base available for your treatment and will benefit future groups of patients who undergo similar treatment to yourself.

"Are there any risks in taking part?"

No. This study only looks at your normal brace treatment and will not alter it in any way.

"Will my participation be kept confidential and my data secure?"

Yes. There will be no names listed in the research project reports. Your data will be stored in a secure area and destroyed after 10 years.

THANK YOU VERY MUCH FOR YOU TIME AND INTEREST IN THIS PROJECT.

Should you have any questions, please do not hesitate to contact us at:

Dr D Palermo
Orthodontic department (2nd floor)
Liverpool University Dental Hospital
Pembroke place, Liverpool, L3 5PS
dpalermo@liverpool.ac.uk
Tel: 0151 706 5068

Appendix 5 – Participant consent & assent forms

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PARENTAL CONSENT FORM

Title of Research Project: Alterations in dietary intake with fixed appliances and in relation to the influence of television advertising

Study funded by: University of Liverpool

Researchers: Dr Norah Flannigan, Dr Daniel Palermo, Professor Susan Higham, Dr Emma Boyland

		Please tick box
1.	My child and I confirm that we have read and have understood the information sheet dated [version 6: November 2017] for the above study. We have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
2.	I understand that my child's participation is voluntary and that my child is free to withdraw at any time without giving any reason, without my child's rights being affected. In addition, should my child not wish to answer any particular question or questions, they are free to decline.	☐
3.	I understand that, under the Data Protection Act (1998), my child can at any time ask for access to the information they provide and can also request the destruction of that information if they wish.	☐
4.	I give permission for members of the research team to have access to my child's responses. I understand that confidentiality and anonymity will be maintained and it will not be possible to identify my child in any reports or publications. I understand that once my child's data is submitted it will be anonymised and once anonymised data is published it will no long be retrievable for destruction.	☐
5.	I consent to the use of audio recording / transcription of meetings and later verbatum quotation in reports/publications (provided my child is not identifiable).	☐
6.	I agree for my child to take part in the above study.	☐

Parent Name	Date	Signature
Name of Person taking consent	Date	Signature
Researcher name	Date	Signature

IRAS Project ID: 228664, Sponsor Ref: UoL001321, REC Ref. 17/NW/0534
V_6.1_14_11_2017 Parental PIS

UNIVERSITY OF LIVERPOOL

CHILD ASSENT FORM

Title of Research Project: Alterations in dietary intake with fixed appliances and in relation to the influence of television advertising

Study funded by: University of Liverpool

Researchers: Dr Norah Flannigan, Dr Daniel Palermo, Professor Susan Higham, Dr Emma Boyland

Please initial box

1. I have read (or had read to you) the information sheet [version 6: November 2017] for the study. I have had the chance to ask questions and I am happy with the answers. ☐
2. I understand that it's OK to stop taking part at any time and that if I do not want to answer any questions then I do not have to. ☐
3. I understand that I can ask for my answers and that my name will not be shown in any reports. No body other than the researchers will be told who I am. ☐
4. I understand that the dentists doing my braces will not be told what my answers were. ☐
5. I agree to take part in the above study. ☐

Child's name	Date	Signature
Name of person taking consent	Date	Signature
Researcher name	Date	Signature

IRAS Project ID: 228664, Sponsor Ref: UoL001321, REC Ref. 17/NW/0534
V_6.1_14_11_2017 Child PIS

Appendix 6 – Framework analysis (abridged)

Aetiology

	A : Aesthetic Motivation	B : Barriers	C : Concerns	D : Difficulties	E : Pain
P1 T1	*I don't want to get marks on my teeth, I want to have like clean teeth after they have come off.* *Yeh coz the only reason I have kinda stopped having as much as I used to is coz I want to make sure I look after me teeth, I used to, I like was scared of what people think of my teeth so I wanna like make them as good as I can while I have got the opportunity* *Participant feels this is their chance to get the best aesthetic result possible and is willing therefore to change their diet.*	*clean it with or..?* *There is nowhere that you can do that though in school. We have like the toilets but it's a bit weird to, coz its like not drinking water if you know what I mean, so you can't put that in your mouth and there is no other places in there that you can go to to wash your mouth out.* *In the morning do you know coz like you are in a rush to get ready, I don't find that I brush me teeth as well as I could have* *Barriers to eating and maintaining the appliances appear to be in time and locations. There is not enought time for participants to clean their braces and when in school it is hard to find a place to remove food trapping etc. This participant outlines the social stigma of using the toilet and that the water is not drinking water.*	*coz the grease off it, I'd be worrying about it staining my teeth coz I wouldn't be able to wash them so yeh.* *This participant is concerned about staining of their teeth, but misunderstands the aetiology of the demineralisations stains that have been described to her. They believe that it is grease that causes demineralisation and that the grease needs to be washed away to avoid stains. In some ways this misunderstanding is not so harmful if it results in the participant practicing better OH measures.*	*gets stuck in but you pull it out.* *you can't have that coz it gets stuck and pulls the wire out the back* *you can't have erm, dairy/ coz it gets do you know like the bottom of your braze underneath it, it gets, like, food like cheese gets stuck under it.* *if you wanna like chew it then that's when it get stuck but if it's like a soft food you can just put it in and swallow but* *Coz it gets trapped and I just can't be bothered getting it out, so I just have food that I know that probably won't get stuck so that I won't have to wash it straight away so I don't..* *I can't have bread coz that gets stuck in.* *like they have pizza and rice but I can't eat that coz the base of the pizza gets stuck* *like jacket potato, I'll have that like with tuna or beans because that doesn't get stuck or if it does, I am able to wash it out.* *Yeh I have gone off like harder and chewy foods coz one it likes aches to chew and I don't like it coz it hurts and it gets stuck* *Food trapping, pulls wire out, participant has to think about what foods will get stuck and also how they will get them out which is usually by washing out with water. This has limited the types of food they can eat. Pt needs effort to eat certain foods as 'cant be bothered getting it out'*	*sometimes you get the odd ache but it is alright.* *like it hurts and gets stuck in but you pull it out.* *like today I probably won't have like the same stuff because it hurts* *it's a lot lot more achy so like hurts to bite on it and I don't really want any more pains so I have like softer food that I can eat, just put in and swallow or put in and I know it's not going to hurt coz I'm not biting dead hard.* *How long does it last for?* *A couple of days, 1-2 days and then it dies down and it will just go and then I'm able to eat as normal.* *now I'm kinda thinking I don't want that coz it just hurts,* *I'll probably just go home and depending on how my pain is then take a painkiller or not.* *Yeh I have gone off like harder and chewy foods coz one it likes aches to chew and I don't like it coz it hurts and it gets stuck* *it was like then pizza like you can get but it's a crispy bottom, well I used to have them but I can't coz like it just hurts.* *This participant often describes painful episodes during the interview, and even gauges the food by 'just put [it] in and I know its not going to hurt. They dscribe the way that pain has altered what they eat as they don't want it to hurt and that they experience pain for 1-2 days after FA appointments afterwich they can eat as normal. They report going off harder chewy foods due to pain/trapping.*
P2 T1		*I am scared of breaking them, I don't want them to break so I keep coming back because one has already broken off* *Breakages! Biggest worry.*	*I am scared of them getting stuck because I did try it once and nearly choked on it so* *Yeah, I had to eat wraps but then that would get stuck as well so I couldn't eat them* *im trying not to get it stuck, and I may get it stuck and I can't get it out so* *[worry about]Getting food stuck coz I couldn't get it out because the jelly sweet I nearly choked on got stuck at the back so I had to get it out, I couldn't do anything about it* *Worries about getting things stuck and nearly choked on sweet!! very serious complication and worrying to patient.*	*Do you usually get pain?* *For about one week after I had them on I did but after that it was fine* *This participants pain lasts for longer at one week.*
P2 T2		*I'm just really conscious of them falling off cos every single time apart from last time there's been something that's fell off so I just didn't wanna come back* *Yeah I'm a lot more conscious of breaking it cos it's happened so many times and sometimes it hurts when it pops off so I try not to break it* *Pain with breakages also. This participant experienced multiple breakages.*	*I've kind of cut some foods out that I can't eat anymore because they just like.... They just get stuck* *Did you have any teeth out?* *I had 2* *And did that make it hard to eat?* *Well yeah cos on the paper that you get given it said eat on the side where your tooth wasn't taken out but it was one from each side so I ate pasta for like a full week* *like sometimes it gets stuck and then it like stays there* *In addition to others talking about avoiding/adjusting foods because of trapping, this patient also had difficulties with chewing because of the extractions they had.*	*I can bite into food but it depends on like how soon after I've had my braces fixed cos it's painful sometimes* *They're hurting now and they hurt for about a week or 5 days..* *Yeah I'm a lot more conscious of breaking it cos it's happened so many times and sometimes it hurts when it pops off so I try not to break it* *Its cos you can feel them moving a bit so yeah* *This participant also has pain for 5-7 days, which is longer that we would normally advise patients of. They also talk about the pain associated with breakages also, which patients should be warned about (this may also cause them to be more careful with hard foods out of fear of the pain associated with a breakage?) They also discuss the feeling of them 'moving'*
P3 T1			*Fizzy drinks and all that and like chocolate and I can't really do that, every time I eat chocolate or something like that I brush my teeth cos it gets stuck in the bottom parts* *Crisps and that get stuck in me teeth right at the bottom part* *Sometimes like you know like where the wire ends like that pokes inside me mouth sometimes* *I dunno what it called but like you know like the braces rub if you get me* *I don't really eat pizza anymore cos I got this caught on like the brace* *when I get them tightened I can't eat like on that side* *When I first got them, I went out with me mates and we had these like chicken kebabs and like I got like a big long piece get caught at the top there* *Further trapping with experiences with mates- embarrassed? pizza, chocolate, crisps. Also difficulties with braces rubbing and wire poking cheeks, even unable to eat on one side after FA adjustments.*	
P3 T2			*when I got it tightened last time I came like its still a little sore now if you get me* *Yeah I can't eat chewitts cos they just keep getting stuck like everytime I bite them they'll get like stuck somewhere in me brace*	*it hurt like you'd rather not eat it than eat it/ if you get me, so like just like hard foods when you bite down its sort of like danno what the word is like agitate or something, like your braze so like your braces start aching* *Yeah like a pressure I think* *Ok, and they kind of ache all the time anyway?* *Err not like when I've had them on for 1-2 weeks' there fine, but like when I first got them on like yeah they ache* *No I can eat it like but it hurts, sometimes it hurts but like its only on like the front teeth if you get me* *Ok* *The side ones are like alright* *Pain only on anterior teeth and not on the back, pain for longer? 1-2 weeks, aching brace described as 'agitate' the brace.*

P4 T1	I want to keep them on obviously so I get straight teeth and everything, but yeh. Final result as driver for change.		I've got to eat like softer food and that coz it hurts and if its harder it will hurt the brace obviously. I'd say a bit yeh like I've gone more careful about what I'm eating and like more like panicky in case like something happens when I eat it or something, so its changed a bit yeh. Coz like I don't want to like snap it coz like if you snap it too many times they will just take it off coz they know you can't take care of it. So I have to be like very careful coz I want to keep them on obviously so I get straight teeth and everything, but yeh. There has been changes in regard to worries over breakages. Fear appliance removal against wishes due to breakages.	Well they feel like most likely the same but I have got a new bit put in which I think is making it better but also I think it is irritating the teeth, so I feel I won't be able to eat on that side but I will be alright. Yeh on the first like it was rubbing there or there, there was like ulcers and that I the bar kept getting caught so I got an ulcer there, but it's all gone now. like chewits I can't have them because they will get all tangled Erm well 2 weeks ago or something, I was having tea and the fork got stuck in my brace! Yeh just coz sometimes like somethings do get stuck and you can just brush it out. Well that's if I eat something and it gets stuck, I will go into the bathroom and just clean it out. Other ways to remove than water- brushing, goes into bathroom to do this. Only participant to describe fork sticking into brace, ulceration has also been a problem.	I've got to eat like softer food and that coz it hurts and if its harder it will hurt the brace obviously. like in school you get chicken wraps and I usually get one of them but I couldn't coz it was a bit hurting like to bite down If you eat like certain things, right, if you eat like certain things and like it messes with the front of your brace your teeth might hurt a bit coz its been pulled and that but.. like hard food really hurts. Just be prepared, because the first 2 days they will hurt, like you can't eat, but after like 3 days you just get used to it, but don't go back to eating all the stuff, like try and make sure you are not eating hard food and make sure its like soft and everything like. Initial pain following adjustments 2 days. GET USED TO IT. Avoid hard food
P4 T2			Like, it's hard to explain, with an apple like I can't just bite into an apple as I used to like you have to cut it up cos if you just bite into it your braces will ping off or something. Erm you've just gotta be more careful how you eat it now more care with items and shows adaption to hard items such as cutting up apples.	Err, well I had to get a tooth taken out so I couldn't really eat on that side for a bit cos it was still hurting like it would just scratch it or something, so it would hurt. So I have to eat on my other side but then I have to eat on my other side as well cos obviously that one will just break away or something cos I'm using that one too much Yeah cos that tooth has been taken out so it's just a wire there so if it just bends or anything it can just snap or come out of place Well for the first few weeks' all I could taste was metal cos of me brace Well when like, sometimes when I get them tightened or when I first got them on I had all like cuts like on my front cos I'm not used to it obviously, but then like sometimes your cheek will just get caught at the back but it's nothing that you can't fix, I dunno you just put Bonjela on or something Further difficulties with Xn of teeth, also the participant worries about over use of the side without extraction due to breakage of the brace. They have also experienced difficulty with the space left by the brace as the wire is fragile and can be bent/lost/snap etc. This participant was also the only one to experience a metalic taste from the brace. This phenomenon was discussed with other participants following this interview, however nobody else found this.	So the pain is the reason why they need to work it up? Yeah, cos when I first got the brace I thought I could just eat normal and then when I bit down into like toast or something it like really hurt cos it was dead sensitive if you know what I mean. But now it's fine Initial naivety- didn't realise it would be so sensitive. Need to work up to harder foods.
P5 T1		I just haven't had the time to chop it up Extra time needed to maintain usual diet with fixed appliances attached		Yeah just like harder vegetables and some fruits and like crisps sometimes and they get like caught.. like anything really can get stuck in them it just depends really How often do you get stuff stuck in them? Erm I'd say like quite often like there's always a bit of something, yeah	Only when I first got them off when obviously they hurt yeah, yeah it would take me longer to eat things cos it would hurt a lot more so I'd be like eating smaller amounts at a time, but not anymore now Erm about a week where it was like sore, really sore but it might just be cos I've got quite a low pain tolerance.. Yeah it feels like they are gonna fall out, like your teeth are gonna fall out Yeah like when you bite into it they are gonna move like slip out of place and it doesn't really hurt when you're not eating, for me anyway, its more when you're chewing that it hurt most or like you think about it well I'm getting them tigehthened so I assume it will hurt again probably yeah, I won't eat this week like hard food and stuff? Longer time to eat, smaller amounts at a time but improved with time. 1/52 duration, feeling- going to fall out.
P5 T2			Is there anything that you worry about with your brace? No, other than it breaking but not really no	food gets stuck in the braces	Yeah, well it depends if I've just got it tightened then I'll be like oh I don't wanna eat like something that will hurt it, so like softer things, but not when its like between like now I'll just eat anything It feels like, I think it feels like my teeth are gonna like fall out and they ache, I cant describe it If you bite down its like pushing them, you feel like they're actually loose in your mouth No its fine now, its only when you get them like tightened 2 days, 2-3 days This participant describes pain most just after tightening apt and can eat anything in between. Again they talk about the feeling of them falling out.
P6 T1	Yeah because she showed me a picture of someone who was having juice all the time and it stained their teeth so that's taught me not to. Use of picture important in patient education and dietary modification as this impacts on the participant.			I just can't, I tried and it got stuck and I had to brush my teeth straight after Yeah, I was having carrots the other day and like mostly everything I eat gets stuck Like when food gets stuck, that's quite embarrassing so I just go to the toilets and I've got a little mirror that I got in the pack.. Brushing used to get food out. Carrots. Also discussed embarrassement felt with food trapping and uses the toilets to secretly remove food so peers don't see.	well, at the start when I first got them I couldn't eat crusty bread because it was really hurting me and that's a thing that I mostly have, I love crusty bread. And is it sore for a few days? Yeah like 3 days So did you take painkillers? Yeah Painkiller use and duration 3/7, exclusion- crusty bread- difficult for patient as she loves this item and had to exclude it, and frequent food for her so had to substitute with other foods.
P6 T2			And what are you worried about happening? If it comes off as I'm like chewing it with it	I don't eat apples, like I did but I reckon that they'll just get stuck like the skin so I just avoid them Like the back wire came out from the bracket Further avoidance, apples cited- skin stuck and food trapping also led to broken braces due to loss of the wire. Presumably this is quite flexible - initial aligning AW such as 014 NiTi and with later thicker/stiffer wires this problem woudl be reduced?	Like cereals some of them are like really hard so and even when I first get them tightened they'll be really sore so I have to stick to like say fruit for my breakfast or toast I've been getting like pain like in my gums like obviously when the teeth are moving and then it's been like rubbing against the inside of my mouth but I've got like wax for that now Alright ok and if you did bite into something what would it feel like? It would really hurt.. Especially on the front 2 teeth. They're the worst Again eating on front teeth is worse. Also talked about pain of rubbing on mouth and use of was adjunct to aid this. Eats fruit etc instead of hard foods like cerial- substitution
P7 T1	But I don't want to get stains on me teeth off the braces so I decided to stay away from it. Demineralisation worry		Yeh I just had the pen in me mouth and then it just fell off and oh god, the whole brace just like started sliding out and I was like me mum's going to kill me! Fear of what their parent will do! Very inconvenient for all involved.	Yeh I couldn't eat at all. Yeh it gets stuck. If the wire is not cut long enough and the brackets have actually got holes in my gums and then cheeks where it just digs in. I don't know why but its like passed on, my nan get really bad ulcers and my mu gets them and I get them. Futher wire digging in and leading to ulcers- made worse by food trapping.	Like everything, you couldn't bite into nothing. Everything was like dead tender and that. So just ate like soft stuff. like your whole mouth was just hurting and I just wanted to pull the brace off. Participant struggled with brace, wanted to remove as everything was tender. Caused avoidance behaviour.

P7 T2	fizzy drinks I don't wanna drink though cos I don't wanna stain my teeth same			I've already got small teeth and then the bracket takes up like all my teeth so I've got nothing to physically bite into the apple with so I just have to cut it up I'll end up like talking and there'll be like food all over my brace It literally gets stuck in the brace so badly When I first get it changed in a way, it literally rips the inside of me mouth but that's it just anything like sticky or you'll chew on just like jelly sweet type things literally get stuck in the back of your mouth First participant to mension the physical size of the masticatory surface of the tooth left to chew with.	When I first got them I like don't wanna eat anything hard cos of the pain But I think when I first got them, it only lasted like 3 days and then I went on holiday so I just forgot about the pain
P8 T1				It wasn't hard it was hard to chew when I eat it gets stuck in my braces Do you get stuff trapped at school? Ermm yeah sometimes And what do you do? I just drink water and then swallow As previous	So apart from sticking into your teeth is it painful as well to bite? Yeah, a little bit
P8 T2			So when it's hard, what are you thinking? Why don't you have it? Cos maybe my braces will break I'm just worried about them breaking as above	I chew normally but sometimes when one of my braces come out it's a bit hard to chew cos of the wire It's hard for me to chew but when there brace I don't really feel like it's hard to chew it sometimes sticks on my braces Broken brace itself physically interupting mastication.	
P9 T1	Erm not really no, I think I was thinking it about myself like coz I don't really, I want my teeth to be like nice afterwards so I try and like follow it, think before I eat anything that would break them or is bad for my teeth but erm sometimes like I drink a bit too many sugary drinks! But like, you now like, I do like juice and that probably a bit too much and squash but.. I try not to have sugary drinks, coz I don't want stains and that around the erm brackets, like get little squares Pt aware of diet mod to avoid demineralisation. However they still have a lot of sufary drinks/juice and so this aesthetic drive has not totaly altered their behaviour.		It is quite difficult erm but mainly worried because I have got quite like gaps of exposed wire and that, so it feels like it might pop out or whatever and I don't want it to fall off and I get the chewy stuff out of them. like I don't want the brace to kinda break or anything because it has broken like chewing on, not on hard stuff, like a sandwich but if it was a hard thing I wouldn't bite on it coz I'm scared it can break and that. Yeh it's not painful it's just a bit, I'm just worried about it coz I don't want it to break. I'm just worried coz sometimes like if it does like get caught or anything like, I don't want it to break Gaps worry patient due to exposed wire- more fears over breakages. Painful too	it was a bit difficult at first like, I have gone back to eating them now but it's just a bit difficult and it's like quite annoying because it gets stuck and brown stuff in my mouth as well like, I have gone back now whenever I eat like, my mouth doesn't close as much any more, so like I don't, I feel like the crumbs go everywhere! Coz my mouth is more open but, because they are quite hard as well so I don't really eat them. Well things get stuck and sometimes like this part did pop out once just from eating , it wasn't really a snap it was more of just a , I was chewing on one side too much and probably something just like pushed it down coz I chew on that side like. It's just a piece of wire with no teeth, so it just popped! no I think it's just coz of the wire being so, it's quite thin as well like, I mean like a big gap and I just chew on that side like I don't chew on this side, so it's probably just pushing down coz it's getting a bit wobbly and then it just broke like, probably my fault! sometimes it's just a bit uncomfortable chewing coz I have to chew quite wide coz like, it's just changed my mouth a little bit Yeh and some like like feta cheese and that, it's quite like, it just embeds itself and then you smile and it's just like, it gets like, not stuck like, you could eat easily with it, just like covers your brace and gets stuck in them.	
P9 T2		you don't really have time to brush your teeth at school so it's a bit like ewww Extra time needed to clean braces- no available during school hours.	I'm more worried about what's healthy for my teeth I haven't eaten many apples cos I'm a bit scared of like biting into the hard thing, it feels like bit like they're gonna break or something it feels at first like there's lots of things in your mouth, there's lots of wires so you don't wanna bite down on them cos you're scared you'll like break them or something Mouth full of things therefore bite may break them.	I haven't really come across trying to eat it yet like I don't know but I probably wouldn't eat it cos it just gets stuck everywhere, so I just wouldn't eat it at all cos it's a bit pointless sometimes I don't really like eating bread and stuff cos then it gets all a bit stuck Yeah I did break it the once, I think it was just a few months' after I got them like at the back where I got my teeth out I've got like a wire like there and it was quite thin cos I'd only had a thin wire on so I was like biting down and it just popped out of the back but he just put it in like easy, I was only eating a sandwich so it wasn't like anything hard that had caused it it just pushed out cos it was a thin wire, it was easy to put back in like and now it doesn't do that cos I've got thicker wires so it's not gonna come out anytime soon Well it just feels really sore on your teeth when you get them and then... sometimes it did rub a bit but not enough that I wanted to put wax on it just cos the metal and sometimes the wires poke in a bit but like its fine, it's was just like quite sore on your teeth sometimes it does feel like they're moving, pulling and pushing which is like a bit uncomfortable sometimes but most of the time it just feels like nothing, so its ok sometimes like sticky food cos I don't, or food that I know might get stuck, I don't want them to get stuck It all got a bit stuck but yeah I probably shouldn't have got one cos it got a bit stuck so I probably wouldn't get one again Again made the point that thicker wires meant that there are less breakages and that even med/soft foods could break the appliance with thin wires. This participant used wax adjuct .	yeah hard stuff is a bit uncomfortable first it like hurt for a bit and then it just feels a bit weird cos you've got all this metal in your mouth Erm it'll probably just feel a bit, it feels like a bit weird when you touch it or when you're eating it feels like not too sore but just a bit like sensitive but it's not that bad cos I've had them changed a few times so it's probably just getting used to it, but as they get like a bit tighter obviously it hurts a little bit more but for less time, only for like a few hours and then it'll be fine It just feels like you've got little bruises kind of like on your teeth, they're a bit sensitive but not like bad like you can still eat with them but it just feels a bit sensitive cos everythings a bit tighter and a bit sore but it's not that bad at all Over time the pain has gotten better- has this participant gotten used to it? Pain symptoms are reducing and the duration of pain following adjustment was also reducing.

	A : Adjuncts	B : Physical Alterations	C : Restriction	D : Substitution	E : Temporal Change
P1 T1	I can get those little tooth picks you know and just get it out until I have finished eating for the night then I'll wash my teeth with the tablet you know the little bristle> Yeh and then just get it, like coz I can't get it out with like my tongue or fingers so I have to get it to get brush out. When I get them changed I do coz it's the ache and it doesn't go so I have to have paracetamol or ibuprofen I'll probably just go home and depending on how my pain is then take a painkiller or not. Like the acid drinks I have a straw so it doesn't go on your teeth but it just goes straight down and it doesn't affect your teeth. I have to drink it with a straw - Use of interprox brushes, analgesics- titrated to pain levels. Use of straw due to worries over acid consumption	If mum buys me like, do you know like coke or orange juice or something like that, I won't drink a whole bottle but it would last me like 2-3 days I'd say I eat less than I did erm but I still have, I say I eat less with the brace than I did without it. don't eat a lot at a time like, spread it out if you know what I mean, for instance if it was like a bag of chocolate buttons, don't have them all in one day, or if you do, don't have them all at one time coz like I feel like it's too much sugar going in. Reduced intake with brace, smaller portions and spread out. Spread out coke over days- bad for dental health wise. Reduced calorific intake due to appliance wear.	you can't have nuts I can't have erm like hard food like crusty bread, like tiger bread, you can't have erm, dairy food I can't have rice I can't have like erm beef coz that's dead chewy I can't have bread coz that gets stuck in. Erm we used to have like sweets and chocolate and sugary drinks but not like diet it would be like the full sugar, usual restrictions as stated.	I have crisps but I have like the skips coz you don't have to chew them they just dissolve on your tongue. I would like, do you know like yogurts and soups or erm I'd have like you know the pasta, tuna and mayo. like easy to put in and they are not hard to chew and I like, you know some people do you know like with the chips, like well done, I don't like mine well done, I like them so they are cooked but they are not hard, they are soft and you can put them in and chew and it doesn't hurt. Instead of restriction of foods, this participate make the case for alteration or substitution of foods such as still having chips but having them softer- not crisp ones. They also substitute hard crisps for softer ones.	Healthier than it was yeh. Er like today I'll probably like have pasta or potato, erm and then after it I'll probably go to having a like a bit more chewy food like sausage, I think now coz I have got used to it, and I know what to expect now I know what does and doesn't get stuck Participant shows a gradual improvemnt in adaption over time and learns what they can and cant heat - normalisation of appliance too.
P2 T1		So has than changed the way you eat or? Yeah , it's a lot slower Fine, I feel I need a little more time to eat Teeth wise, I used to like eat a lot more but because I am eating slower, I'm full Like making them small, eating small bits at a time. If I ate cucumber, I would have to cut it up into small pieces like swallow it I normally put them in the fridge so it's not like gooey so you can just snap it off and eat it that way alternate methods like using the fridge to solidify foods to 'snap'. Generally needs more time to eat and has smaller portions. Due to increased time to eat, the participant feels full- this may reduced total amount of food consumed also.	I don't eat jelly sweets anymore like I used to No, cucumber I can't eat anymore Yeah, and lettuce gets stuck around so I can't eat Yeah, I had to eat wraps but then that would get stuck as well so I couldn't eat them Like less snacks surprising cucumber stated by many participants, previously i thought this was a soft food/easier to eat.		For the first week I had to just eat pasta cos I couldn't eat anything like a baguette or anything, now I can, sort of. So it's not like a pressure or a pain thing? No. in the first week it was but other than that no. Pressure/pain first week then no more? one week of sfoter foods such as pasta
P2 T2	I just try and use toothpicks and the brushes and stuff Normally yeah or when I get home I'll just use the toothbrush and brush my teeth to get all the stuff out So you don't take anything? No, I tried it and it doesn't work Paracetamol doesn't work - Also use of toothpick, brushes, finds that analgesics don't work on pain.	I'm just like trying to eat with my back teeth and not put any pressure on my front teeth if it's like apples and stuff I have to cut them up into like tiny pieces so I can eat them Ok. Does it take you longer to eat now? Ermm yeah, I'm slower than everyone else and I didn't used to be Oh no I have to like cut it up and then chew it but I can't.... It doesn't really bother me actually I'll eat a lot slower and soft foods for the week Usual smaller pieces and taking longer to eat compared to before, but this participant also states that they eat with the back teeth insead of putting pressure on the front teeth.	I don't know, it depends what kind of food it is cos if tis like, I still can't eat cucumber but if I'm hungry I'll just try Just don't eat anything like sticky or like apples that you have to bite into cos they can fall off I've kind of cut some foods out that I can't eat anymore because they just like.... They just get stuck Yeah don't like eat a lot of sugary foods but I kinda did when I went to America and now I might not hardly eat anything no change with cucumber over time.		I can bite into food but it depends on like how soon after I've had my braces fixed cos it's painful sometimes Because in the first week it hurts so I couldn't really bite like hard foods but then like later on I'll be able to After adjustments it will be painful and this fades with time. Therefore avoids hard foods for the first week.
P3 T1	Err yeah, like on the odd time I'll have a fizzy drink but I'll use a straw so...	But you don't miss chocolate or? I still have it sometimes but not as much as I used to do you still eat apples? Err yeah but like the ones you get in Tesco's you get in a little pack Right ok That's already cut up sliced up apples and all that Yeah when I'm at my mates, like what I'd normally do is just like get a bottle of water and like put it in me mouth and spit it out and like most of it comes out chocolate bits and they get caught so I'll just like drink lots of water and just swill me mouth out and I'll spit it out. Smaller pieces cut up as previous but this participant also state buying pre-sliced apples and smaller versions.	Fizzy drinks and all that and like chocolate and I can't really do that, every time I eat chocolate or something like that I brush my teeth cos it gets stuck in the bottom parts Yeah, cant have fizzy drinks anymore I don't really eat pizza anymore cos I got this caught on like the brace When I first got them on I couldn't really eat apples anymore and me teeth at the top I couldn't like eat anything so I'm not gonna try and bite into the apple when its dead sore. Stay away from fizzy drinks and you can't really eat like much chocolate you've gotta like balance your diet As previous- restrictions. Fizzy drinks are important to avoid.	Ok, so you can eat the same as your mates? Yeah Apart from like if we stay in someones and they'll have like 'Luco's' and all that and I'll sit there with flavoured water Shes stopped doing like all, like when she does like steak she'll do me a pasta or something Err yeah, like I used always like buy like a Lucozade or something before I went to school and now I've gotta buy like a bottle of water or something This pt substitutes a fizzy drink with what they think is a non-harmful drink but again highlights the miscommunication or misunderstanding of patiens.	When I first got them on I couldn't really eat apples anymore and me teeth at the top I couldn't like eat anything so I'm not gonna try and bite into the apple when its dead sore. When I first got them on, like when I got my braces tightened like last time it doesn't really do that anymore Soreness aetiology for avoiding hard food- example given her is an apple. Tightening doesn't appeart to be as painful anymore.

P3 T2	When its painful have you taken painkillers? Err yeah	you've gotta eat like soft food like soup and all that I like had something like pasta for dinner like something soft Ok, and even if you chop it up smaller does it help? Yeah it does a bit like States very planely that alterations are made with soft foods.	I don't really drink fizzy drinks no more that's it really, I still eat everything else I used to eat Only the one like don't drink fizzy drinks, you can have them like once in a while but like can't really have them		Erm yeah like last time I said to you I couldn't really eat steak and I like steak now if you get me I can eat like tougher foods now and they don't get stuck as much Like when I first got it done like they were aching a bit but like but now like it doesn't really when im eating I'd say like after like a week then it'll be normal but theres days it'll hurt a bit on some of them Yeah, I think its like me teeth are like used to having the brace on like hard food Err, no like say if I get them like done on Friday, on Wednesday I'll probably go back to the normal but like on Monday, Tuesday I'll only be able to eat something like pasta or something Yeah, like when I first got them on like it was hard to eat something but now its sort of like all alright like when I'm eating something like toast Noodles when you first get them Possitive improvement with time- participant now able to eat steak even! Increase in toughness of foods that they can chew. As with others there is an initial phase of soreness and reduced consumption of hard foods, which wains with time
P4 T1	Yeh I have had a paracetamol already! just coz my friend who had braces- she's just got them off I think like last year or something, but she said if you take pain killers like before it helps like the pain more, so it doesn't hurt as much. Oh sometimes in my blazer I keep you know, what are they called? Like the little flossy things but like they are one word. Brushing is quite important. Like when you get them on you get like a special toothbrush, I don't what they are called like, a little thing at the bottom like you can get in the middle of them, what are they called? A tooth pick but its not a tooth pick Oh yeh make sure you mouthwash and everything just so you can into the places your toothbrush can't get. - Advice from friend regarding analgesic use. Carries interprox brushes around with them. More care over brace? Thinks that brushing is quite important.	Ok and have you changed anything to eat the same food like cut it up smaller? Yeh coz like when it's bigger it's harder. Erm you can's like just it into an apple, you have to like cut it up Yeh yogurts are fine because you can swallow yogurt and that, fruits ok, grapes at first they are a bit hard like to eat unless you cut them obviously The same but I eat it different. Oh yeh you are not allowed to eat the crispy bit on potatoes either, you have to cut it off! if I have chewy I have to keep it towards the back of my mouth now not towards the front of the mouth No coz if you chew it on the back teeth it like more or less like goes on your gums as well. like eat more soft foods like you do like noodles and that Surprising hard foods such as grapes. Unless cut up. I would have thought that they were a soft food. More evidence of participants masticating on posterior teeth which they find easier.	Yeh you're not allowed to eat pizza crusts! Coz its too hard! Erm you can's like just it into an apple, you have to like cut it up yeh you can't eat crusts on bread either or toast as its too hard I only really ate like toast or sandwiches coz I couldn't, like in school you get chicken wraps and I usually get one of them but I couldn't coz it was a bit hurting like to bite down Oh yeh you are not allowed to eat the crispy bit on potatoes either, you have to cut it off! like chewits I can't have them because they will get all tangled Yes I basically more or less stopped drinking fizzy drinks because we used to have it at me Nan's but she has bought flavoured water now instead coz I told her to! Just be prepared, because the first 2 days they will hurt, like you can't eat, but after like 3 days you just get used to it, but don't go back to eating all the stuff, like try and make sure you are not eating hard food and make sure its like soft and everything like. Usual foods restricted. Pain aspect also. missunerstanding with fizzy drinks sub for flaoured water!	Yes I basically more or less stopped drinking fizzy drinks because we used to have it at me Nan's but she has bought flavoured water now instead coz I told her to! Again misunderstanding whereby the patient is now doing harm to the dentition, despite trying to do the right thing and restricting themselves!	The first week they hurt a lot, but you get used to them after that. No coz when you get used to it you can eat the same food as you used to but not as hard stuff. So the foods at school, do you still eat the same food? Yeh, I couldn't at first. how do you feel about that? Well at first it was a bit weird, like its just normal now. Yeh coz I eat more fruit and that now. like eat more soft foods like you do like noodles and that, but then you can build it up a bit more if you know what I mean. - Very similar one week to get used to. Participant eats same as before but not as hard. Normalisation for this patient also. Noodles again a popular choice for soft food.
P4 T2	I have paracetamol and I'm fine Well when like, sometimes when I get them tightened or when I first got them on I had all like cuts like on my front cos I'm not used to it obviously, but then like sometimes your cheek will just get caught at the back but it's nothing that you can't fix, I dunno you just put Bonjela on or something Yeah I did try wax and it did work cos like I put it there and then it was fine, nothing rubbed and then on the back it didn't rub either I think you were saying you used the little brushes and I think you said you took them with you to school was it? Yeah just in case I did get anything stuck in me brace - reports that paracetamol does work for them. Also experienced cuts to mouth from appliance- used Bonjela! Satisfied with orthodontic wax.	I can't just bite into an apple as I used to like you have to cut it up cos if you just bite into it your braces will ping off or something. Erm you've just gotta be more careful how you eat it now Ok. So do you mean cutting it up? Yeah I just like either leave it, if it's only a little bit or like cut it off and then just eat it Do you think that's cos you got used to it or do you think your teeth have just moved into better place I think it's both, like I've got used to it but they have moved better I don't really take me time I just eat my food and it's alright usually, unless like when you get them tightened it takes me like an hour just to eat a packet of crisps or something Cos I was more concentrating like I dunno like focusing on me brace and I couldn't really eat on me teeth so I had to like use me gums if you know what I mean and then all I could taste was like metal really This participant talks about their mastication getting better over time due to the alignment of the teeth- better position. Use of 'gums' to eat. Also increased time to eat after adjustments made to brace.	You gotta like, in the food you've gotta look at the sugar and all that cos if you like if you miss the slightest part on your brace like you'll get like yellow boxes around the brace and then they won't go for ages so Like not eating hard food and keeping eating soft food so it doesn't like snap or anything Well I eat pizza but not the crust, cos the crust is like hard and it'll snap it Like, it's hard to explain, with an apple like I can't just bite into an apple as I used to like you have to cut it up cos if you just bite into it your braces will ping off or something. Erm you've just gotta be more careful how you eat it now Ok, what have you cut out that's made it healthier? Like mostly the sugary foods and that or like sweets, you know refreshers? I used to be obsessed with them I'd always eat them but I can't eat them now so I can't like really... yeah or like Maaam's or stuff like that if it's something I can't eat I usually just try not to eat it and just avoid it but if there is another way like I can eat it, but I've gotta be careful, I'll do that Some healthy changes also not just because of hardness of the food.		Well, I don't really think I'm like eating different like the way I'm eating but I have a bit cos I can feel like my back teeth have like moved more forward, so like they're in line so it felt weird to eat at first but now I'm just used to it, it's just normal Err yeah it used to break more at the beginning cos like I think it's cos I weren't used to it I didn't have to worry about it how I ate before but like when I first got it I thought I could just eat the same things but I can't, but now I'm just used to it now and I know what I can and can't eat work your way up slowly but don't just go and have an apple straight away, cos like I had to have noodles for a few days or like spaghetti cos I couldn't eat, so then I'd just tell them to eat soft food and then work your way up Over 2 weeks' I'd say, like go soft food for one week then a little bit harder and then after 3 weeks' you should be fine by then Yeah I did try wax and it did work cos like I put it there and then it was fine, nothing rubbed and then on the back it didn't rub either And do you still use that? Not really no, now if it hurts I just deal with it, cos I can never really find me wax to be honest I like leave it in one place and then it's gone - Movement of teeth- alignment has helped this patient. Also normalisation. reduced breakages now. Adaption phase. Build up. Over 2 weeks build up to harder foods. Adjuncts
P5 T1	You just use tooth things the pick things do you carry them around with you? Erm not to school though I think I wouldn't use that stuff there but if it's at school I just like with water just like wash it around, and just get on with it really Did you take pain killers and thing? Yeah, only if it was like really sore though, like the first few days - Wouldn't use interprox brushes at school- why not?? stigma of use? embarrassed?	have you changed anything? Erm, not in like the terms of what I eat but in how I eat it more than what I eat so like I wouldn't like bite into an apple or like use my teeth to use things like open bottles or anything it would be like smaller, I like chop it up instead of like going straight in Erm it doesn't really bother me it just takes more time but its fine Only when I first got them off when obviously they hurt yeah, yeah it would take me longer to eat things cos it would hurt a lot more so I'd be like eating smaller amounts at a time, but not anymore now same findings	Erm just like hard foods, just like I dunno, erm just like cucumber or something like that. Like chewy foods, like sweets, certain sweets that are dead chewy to avoid them Yeah just like harder vegetables and some fruits and like crisps sometimes and they get like caught.. like anything really can get stuck in them it just depends really Cucumber again. Fruits and veg also avoided here.		Only when I first got them off when obviously they hurt yeah, yeah it would take me longer to eat things cos it would hurt a lot more so I'd be like eating smaller amounts at a time, but not anymore now I would like for the first week or so, I would have a lot more like mashed potato and stuff but now I've just changed it since, after that. As above- nothing new

P5 T2	No I wore the wax to begin with because I wasn't used to having them in but now I'm just used to it so I don't really use it at all really Use the things, but I don't know what they're called, the little floss things - No longer needs wax	I always chew on the back anyway so I don't think it's much changed because I've got braces	Yeah, well it depends if I've just got it tightened then I'll be like oh I don't wanna eat like something that will hurt it, so like softer things, but not when its like between like now I'll just eat anything Avoidance only needed after adjustment! other wise eats what they want.		I don't really do chop things up as much but I don't know whether that's just cos I cant be bothered to or I just don't feel like I need to anymore Yeah I just got more used to having them and how to eat with them I suppose the wires quite thick now Yeah it is especially on the bottom yeah Has that helped? Yeah I think they've gone a lot straighter and they don't really break, I don't think I've ever broken my bottom ones, its always on the top... I think the longer you have them the less conscious you are of them so you're not gonna be like worried about breaking them as much or you don't feel them as often so yeah you just kind of eat the same things as you would previously, however you want really - Decreased reliance on adaptive mechanisms. can't be bothered?? again thicker wires thought to help. Reduced breakages.
P6 T1	The interdental brushes	Ok, so have you got around it? Well at first I was just eating the inside of it and then one day I just tried it because I was having soup so I just dipped it in and I was fine then . I can get some things out with my tongue but then in school I take them in my blazer pocket Yeah, I soak them in milk first and then eat them and they go soggy well with steak once my dad chopped them up really small then it was easier because it weren't as chewy Even steak if chopped up enough!	when I've had braces now I've been having less chocolate and less fizzy drinks and less juice because I never used to like water, and that sounds really weird but, and I used to have juice whenever I needed a drink I'd have juice but now I have water. Because erm like I'm just not allowed. I have juice with my meals but I don't have fizzy drinks unless its' like a special occasion well, at the start when I first got them I couldn't eat crusty bread because it was really hurting me and that's a thing that I mostly have, I love crusty bread. Like caramel, like Twix's and chewies... I don't eat the crust on the pizza, my brother eats them. When things are difficult to chew is there anything you use to get around that or do you just leave them? I just leave them Don't eat hard food at first, try to stay away from the fizzy side of drinks, Restriction of juice - now water. Misunderstanding again of juice as a healthy alt to fizzy drinks.	Ermm Wotsits, if I have crisps I can only have Wotsits because I can suck them then instead of getting a slush I would get flavoured water or something. Again the issue of flavoured water. Also pt wisely eats a softer version of crisps and adpts the eating mechanism.	I was having just dry toast at first because I wasn't really eating much because of how much it was hurting me but as it went on I have been eating more things now. So you found it difficult to physically chew your food? Yeah And is that the same now or was that just at first? That was just at first I think it was because they were tight so at first I was scared to eat because I thought it would hurt but then as they were getting looser it became easier - Nothing new
P6 T2	I use you I know the little interdental brushes it's been like rubbing against the inside of my mouth but I've got like wax for that now I just have to take Paracetamol and it takes the pain away - Wax has been useful Analgesic use also useful.	Yeah so I've not been eating as much if you know what I mean if I'm having like Sunday dinner I have to cut everything up small with steak though I have to cut it like really small Takes me ages I have to like, if like my brace breaks it normally breaks on this side so I just stick to eating on the other side so that makes it easier and then it doesn't snap then if I had like meat on my Sunday dinner, cos normally it's quite thin so I can bite into that Well I mainly have soup after today, it's only for a few days though but I have to like chew with my tongue if you know what I mean alternate eating methods by chewing with their tonge.	I'm not allowed like hard crisp or like caramel or chewies Well I don't have fizzy drinks anymore but I have a cup of juice with my meals Yeah, like crusty bread I don't eat apples, like I did but I reckon that they'll just get stuck like the skin so I just avoid them Like haribos, I can't have them anymore Or like say like with garlic bread like I don't eat the crust I just have the soft part in the middle Well, my friend does have chewies but I just.. cos well I have been told not to have to have chewies cos it can like get stuck so I just avoid them Yeah she said like no like chewies or Haribo or anything or like caramel or fizzy drinks restrict haribos and garlic bread. chewies.	Yeah like I don't really have like potatoes on my Sunday dinner anymore but have mash instead so it's easier for me then Good idea as above- different version of same food stable.	At first it was like hard to get used to it cos obviously you've got a load of metal in your mouth but I can't really remember what it was like without them now So when you get them changed like today and they tighten them, will it hurt again? Yeah Ok and that's no better than before? No... It's probably worse the first time cos I weren't really used to it but now I know what I have to do - Learning- pt has learnt what to do
P7 T1	I just took ibuprofen. I don't have one on me but I usually carry them on me all the time, its like a tiny little thing with a brush on the end, and it goes in between the brackets. So I have orange juice now and again but with a straw though. Uses ibuprofen before appointments. Interprox use, straw use wih juice		I don't eat hard stuff, really hard like, some sweets like the hard boiled ones, I stay away from them. It's like hard bold sweets like sometimes mints and that, I don't eat chewy. I used to eat that quite a lot. Well I stay away from acidic drinks. I stay away from like sugary drinks and that, like orange juice, that was a big one I had to stay away from Stay away from garlic bread. avoids sweets, acidic drinks, sugary drinks, OJ, similar to T1 interview		When I first got my braces on, I literally ate nothing. Nil
P7 T2	So you have these like little... I literally brought them in my bag in the car I carry these like little tooth picks The wax is the worst thing in the whole wide world, it literally, like you put it in and it'll be floating around your mouth within 2 seconds it does not work whatsoever Do you have like mouthwash or anything like that? Sometimes yeah - DOES NOT LIKE WAX!! sometimes uses mouthwash and interprox brushes.	apple you can't bite into it so you have to like physically like my teeth won't go into it I don't know why so I just have to cut it up	like don't eat like stuff with high sugar levels Yeah, probably like jelly sweets they'll probably get stuck so don't eat them Halloween things like the apples that you get in the stuff, I would NOT go near them As previous		When I first got them I like don't wanna eat anything hard cos of the pain I don't find it painful when I get them tightened no more When I first got them on I thought it was like the biggest thing I thought like I couldn't close me mouth, that's about it How long was that for? The first week it took me to get used to it - Pain aetiology. No longer pain ful with adjustments?!

P8 T1	Do you get stuff trapped at school? Ermm yeah sometimes And what do you do? I just drink water and then swallow do a mouthwash after - with food trapping participant uses water - doesn't talk about tepe use.	do you eat the pizza crust as well? No I don't eat the bottom part I just eat the top I don't really like to eat it fast	apple, I can't eat full I can only like eat them chopped and like carrot and cucumber, I can't like eat it cos it's hard for me chew, ermm chips, like not fried, the normal ones, crisps, when I eat it gets stuck in my braces So have you stopped that or can you have chewing gum? No I stopped. SAME		Its ok, at first it was sore
P8 T2	I go to the bathroom and get it off with some water I use mouthwash	Ok and last time I think we were saying you were having trouble eating some foods like apples? Yeah, my mum peels it and then she cuts them so it's more easy for me to eat You take the skin off? Yeah she peels the skin off and then she cuts them into small pieces so I can eat Erm chicken, she makes it more smaller Did you say you have a lot of vegetables, so you boil it more? Yeah like boiled carrots But I can't eat it proper like, I can't eat the carrot I have to boil it, I'd usually have to have it when it's softer I like chewing at the back As above	you eat the top of the pizza but you don't eat the bottom Yeah cos its hard I can't eat like meat And what kind of things were too hard? Like chicken or sometimes carrots. When they have a roast dinner I can't really have the chicken. Sometimes when it's like jacket potato or pizza I eat it Same	But I can't eat it proper like, I can't eat the carrot I have to boil it, As above but with veg	Your braces, are they ever uncomfortable or sore? First they were, when I got them on they were sore but now they're not How long did it last for? Couple of days when I couldn't chew but then I got better - not new
P9 T1	I just brush them, get it out with a little interdental brush sometimes and stuff like. do you ever take painkillers or..? I did for the first week but then it just went away like. - As above	like crusty bread is quite hard but I just rip it up and put it in my mouth rather than bite it, I can't really rip it much. I mainly eat at the back like I don't bite anymore, I try to think, I do think about my braces if someone like gave me like something to eat, like that's a bit hard, I would just like cut it up or like, I'd only not eat something if it was like really going to break them or like, like apples and that, it's like just a few things, like otherwise I just try and cut them up or break them off instead like to try and eat them! I eat slower as well because I am more careful I think. I'd still order a burger but I'd like cut it open like, eat it with my knife and fork rather than like pick it up and bite it! Did you say it takes longer to eat things or? Yeh it does like, I'm not sure like why that is, I just take longer, probably because I am more careful. It takes like longer but I am more careful when I eat as well. Do you eat the same amount? Yeh, quite a lot! Just a bit longer yeh. Rip up crusty bread, also eats at the back, cuts up, few things are considered too hard. eats slower, use of cutlery	I haven't had an apple, erm like caramels and like most sweets really like, what are they called, fruitellas and stuff like that Your apples, have you tried cutting that up? Yeh, I cut one up the other week but it was still quite like hard to bite like and I don't know it feels like uncomfortable so I don't really try. Coz my teeth weren't closing but like not eat like tiger bread and stuff like that and something hard I don't like biting because it could pop them off or whatever. I just like don't do chewy stuff and caramels and don't eat them coz same		It's good yeh but sore at first but you i'm used to it completely now! Yeh yeh, it's just a bit different to eat with them at first but it's just the same now like. It just feels like my normal teeth now Eat soft foods at first and like build it up because it is quite hard at first and it's quite like scary like biting with them coz you think they are going to pop off, but they won't probably! But don't bite, that's like, don't rip stuff off with your teeth coz it's not good - Normality, build up, initially sore, completely used to it now!
P9 T2	So you don't take painkillers? Nothing like that? When I first got them I did cos it was all a bit like ahhh and like when I got my teeth out I did sometimes I bring an interdental brush just to clean them out a bit cos it's a bit disgusting if there's stuff stuck in them.. -As abo ve	I don't eat many apples. I cut them up probably to eat them instead of biting in cos it's just a bit I dunno it's weird, its feels like pushing against them and I don't want them to break and its quite hard so that's it really though I just cut them up or like if anything is a bit harder or stuck in my teeth Do you find it takes longer to eat? It did at first definitely like cos it just feels so weird but now that they feel normal it's just the same I think cos like it felt so different so I was just like chewing really carefully and I was quite conscious of them being there cos they didn't feel like my teeth but now they just feel like my teeth so.. Is there a part of your mouth that's easy to eat on? No not really mmmm I'm not sure actually erm sometimes the back and sides of the mouth are a bit easier as above	like less sugary drinks, like most of the time I probably won't pick a fizzy drinks, I haven't eaten many apples cos I'm a bit scared of like biting into the hard thing, it feels like bit like they're gonna break or something like I just won't eat like caramel as you probably shouldn't eat at all cos it breaks them Same	Yeah like when I first had them on if my mum and dad were having something like I don't know like, something hard, I'd have like some vegetables which are quite hard I'd have them really soft or beans instead which were easier to eat and I take like an orange to school like every day and I used to take like an apple or an orange or banana sometimes but it's a bit of a faff to eat an apple in school	No not really like, when I first got them it was a bit weird like in like it was a bit sore cos you've got these weird things in your mouth like but nothing like really bad and when I get them changed its just fine, it's just like different tightness so it just feels different but not painful really, it's a bit sore but its fine It did at first [take longer] definitely like cos it just feels so weird but now that they feel normal it's just the same I think cos like it felt so different so I was just like chewing really carefully and I was quite conscious of them being there cos they didn't feel like my teeth but now they just feel like my teeth so.. Obviously it pushes like your lips out a lot but now your mouth has just gotten used to that so it just went back to normal I think Ok, and how long did that take til it felt like that? Probably like a month maybe, mm yeah probably a month cos first it like hurt for a bit and then it just feels a bit weird cos you've got all this metal in your mouth but now it's ok yeah I have them at school so like that's fine obviously it's just like when I first got them it was a bit weird but there soft so its ok now, it's just normal I used to take like an apple or an orange or banana sometimes but it's a bit of a faff to eat an apple in school and like cut it up or actually eat it so... no I just take oranges and I would like change it for something softer but now I can eat it so I don't really change it I think it's just, quite easy to eat with them and get on with them... it's obviously gotten better for me, I didn't think it was easy, but it's definitely just normal now so its fine yeah - Similar to above statements. Feeling of pushing lip out. Can eat most things now.

	A : Attitude	B : Habits & Routine	C : Learning	D : Social
P1 T1	Coz it gets trapped and I just can't be bothered getting it out, so I just have food that I know that probably won't get stuck so that I won't have to wash it straight away so I don't.. , or I don't fancy it because I can't be bothered like trying to get it out after I have finished. - Effort required to eat certain foods- not worth eathing them because of the extra effort.	on a school day I don't eat as much and at weekends I think I eat a bit more but I don't because I don't want to get up until like after 10 so I don't really eat until dinner time. So I'm missing out on my breakfast. I normally have 3 meals and like a packet of crisps between dinner and lunch, and on a school day I'll have my breakfast and I won't eat when I'm in school, and then I'll come home and I'll be starving and then I'll have my tea and then wait and then have a cup of tea and biscuits and then that'll be me done. I did have them, I had mocks when preparing for year 11. Erm but I still didn't eat then coz, I think also you know with the heat that's been at the minute, I don't really eat when its warm coz it makes me feel like sickly, I don't really eat then. - Reduced intake on weeked. Wake up lateer. DOESNT EAT IN SCHOOL. Effected by heat in summer.	white squares? I think it is the grease that's going to do that, like if you, we don't cook that in the house like, you go out to eat it so I'm scared I am not able to brush my teeth straight after, I feel like the grease is going to get on and like, and acid deep stuff make it all like dirty. now I'm kinda thinking I don't want that coz it just hurts, I got told not to have erm acid drinks or don't have sugar on a regular basis like have them on a treat, er told me not to have hard food when I have got them changed coz it can, if the glue isn't set properly they can come off. Er and I got told to wash them, like if I had a greasy or fatty food or a sugary or acidy food then got told to wash me teeth after and in the morning and at night time wash me teeth but at night time have a tablet. I think now coz I have got used to it, and I know what to expect now I know what does and doesn't get stuck coz the grease off it, I'd be worrying about it staining my teeth coz I wouldn't be able to wash them so yeh. - Misunderstanding of 'grease' being the cause of acidic demineralisation.	I can't have bread coz that gets stuck in. I can have it but like I tend not to have it quite a lot coz, like in school time I won't have it coz it'll get stuck and when I talk it like.. Can I just chip in - he has stopped eating in school because of the brace. it's a bit weird to bring soup. I just have water in school and when I go home I just have my tea I won't have like chocolate or sweets unless a certain occasion like if the family was to come down like, you go out to eat it so I'm scared I am not able to brush my teeth straight after, the wire comes out the back and then it's a bit embarrassing coz like, some of my friends do have braces but some of them don't, so they don't really understand, so I have to like go and it changed and get it put back in, but that's embarrassing coz I don't really want to, they don't really see what I'm coming from. I don't really go out that much with my friends, I am normally in coz I have to look after my parents but erm if I was to go out, if they go out thy go to subway or macdonalds or the chippy and I'd buy something and I'd eat it but then I would be worrying about, - Big difference at school! doesnt eat there just water, gets stuck and then has to talk in school- embarrassment? weird to bring soup? weird to who- peers? Needs to brush teeth straight after eating- cant at school? Embarrassment if wire out @school, not all friends have braces to understand,
P2 T1		Yeah because on a weekend I do dance so I take a lunch but I don't put as much chocolate in now I just put more foods I can eat cos I don't really have time anyway and on Sunday I normally wake up late so I don't really eat Sunday anyway changes with dance. dont eat as much sunday wake up late		Is it ever embarrassing when you're eating? I have to try and get food out at lunch cos I can't just go somewhere so I do it in public so... - Has to 'do it in public' in front of peers- embarrassing.
P2 T2	I've just got back from holiday and I ate quite a lot so now I'm not eating anything over the past couple of weeks' do you think about what you can eat? Yeah most of the time I do but sometimes I don't I just eat it Ok, how do you feel about any changes you've had to make? I've been fine im not really that bothered Oh no I have to like cut it up and then chew it but I can't.... It doesn't really bother me actually How have you coped in general with your brace? It's not really bothered me, apart from the first week but other than that it's not bothered me apart from it getting stuck, especially in the bar across me mouth but other than that its ok it hasn't bothered me at all what I'm eating like with the brace like it doesn't make a difference I don't think - Acceptance of changes- not too perturbed. Not changed? not much diff	Probably yeah, I feel like I just eat 3 meals and like a little snack when I get home from school but then before that I felt like I was eating a lot more - Reduced now		All the time or just now and then? Just now and then cos I feel kind of awkward doing it at school Where do you clean them? Sometimes I just try and get it out like with my tongue like and it does work but if its like stuck I just have to do it Do you do it in front of people? Are you not bothered? I'm not really bothered, most of my friends have got braces anyway Is your diet the same as your family? Like do you all eat the same things? My dad eats a lot more than me We don't cook separately do we? No Is it ever embarrassing? Ermm no cos most of my friends have got braces so they all know what it's like so I'm not really bothered - Awkward cleaning @ school, Not too bothered as friends have braces also.
P3 T1	So how do you feel about having to change what you eat? Not really that bothered to be honest When they come off, do you think that's the orthodontists fault or do you think its anyone's fault? Nah it's my fault like and like they weren't glued on properly but like for the one where I was bending the brace thing that was my fault but I don't really know what happened with the other one Err yeah, like sometimes I'll want like a can of coke or something and then I'll think about me brace and realise I can't -Also not bothered by change. Takes responsibility for breakage.	You say you were bending the brace? Not the brace, the wire like when I first got it like I remember one time I was bending that and then I'd stop then now cos a few like, not the last appointment the one before I got like strong ones so I can't really bend it but when I had the thin weak one I was bending it for like a week or something then the thing came off - Physical habit - detrimental to brace.	She told me that it would rot the brace or something, it'd start breaking them all What do you think happens if you do? The braces will like turn like all like all like green or something like that Ok, so you can eat the same as your mates? Yeah Apart from like if we stay in someones and they'll have like 'Luco's' and all that and I'll sit there with flavoured water advice you got from your orthodontist? Stay away from fizzy drinks is the only one I can really remember and don't eat too much chocolate or something cos that'll also rot the brace No, I'd try and eat it like try one of them and see if it's alright and like if I can't really eat it I'll just leave them or like if I can like can't really eat it or I'm not bothered ill just leave it. - Again misunderstandings of advice given by orthodontist. Although remebered to avoid fiz/sugar but unaware of flavoured water containing acid.	Erm yeah but like I do it in the toilets Ok, so that's easier isn't then and your mates don't wonder where you are or do you do it in front of them? Sometimes they follow me sometimes they don't like really care - Uses the toilets to clean. Peers are not interested in cleaning the brace and participant doesn't appear to be anxious about cleaning in front of them.
P3 T2	so like steak or meat or something like hard, I'd rather just have noodles		Err I've been told to eat less like stuff with sugar in, cos it'll rot the braces - Wrong reason but right change!	

P4 T1	you can't eat crusts on bread either or toast as its too hard, which I don't mind anyway coz I don't like crusts! how do you feel about that? Well at first it was a bit weird, like its just normal now. And do you miss that? or just used to it? I don't really miss is that much. I'd say a bit yeh like I've gone more careful about what I'm eating and like more like panicky in case like something happens when I eat it or something, so its changed a bit yeh. I care about obviously damaging my teeth and breaking it but I am more careful about both other things than I was before. - Participant taking responsibility for appliance. not too concerned about changes.	have to keep it towards the back of my mouth now not towards the front of the mouth but like I just keep forgetting and going to the front and then oh I can't do that! Sometimes I just forget I have them and I just go to eat like, because if you just bite into an apple the brace will just pop off, so I just keep forgetting and then I just realise before I go to eat that I have got to cut it up! if on dance days, coz I have dance every day apart from Tuesday and Friday and Sunday, but like before I go to dance I'll have like a banana or something and I will have my tea when I come back. Well on the weekend it more or less stays the same, but I do more snacking at the weekend coz I'm at my nan's so I do get a bit bored and just eat! - Can be worse on weekends bored at nans, diff with activites such as dance, normalisation- brace becomes normal and forget its on therefore dont mod food choices.	coz they said like if I am going to eat like sugar, have it in one attack instead of like some now and then hours later coz it will just yeh. Yes I basically more or less stopped drinking fizzy drinks because we used to have it at me Nan's but she has bought flavoured water now instead coz I told her to! Yeh and if I do like fizzy drinking, as soon as I have drunk it, I will go and brush my teeth just to like its not getting like sticking to my teeth and all that. - Advice of orthodontist remembered. But misunderstood and still has flavoured water and as a substitute as well!! Also brushes teeth straight after!	Well none of my friends have got them so we were like oh like, all wanted to see them! just coz my friend who had braces- she's just got them off I think like last year or something, but she said if you take pain killers like before it helps like the pain more, so it doesn't hurt as much. Roughly in lunch coz the wrap might get stuck! Does anyone say anything or..? No coz I just like go to the toilet and like get it out. Ok so is it embarrassing? It's not really just, Yeh I just don't want other people seeing me brush my teeth! Do you think people in school care as much about braces? Yeh I think more people want them. Want them? Ok Coz it makes your teeth look like dead straight and like - FRIENDS also want them? uses toilet to clean out. Not 'really' embarrassing? Increased want for braces at school for aesthetic benefit- links to social media perhaps? doesn't want others to see her cleaning her teth
P4 T2	I just like usually get chicken nuggets but I like get garlic bread or something but you have to be careful like, if it's hard, you know like crispy on the end bit Well, I don't really think I'm like eating different like the way I'm eating but I have a bit cos I can feel like my back teeth have like moved more forward, so like they're in line so it felt weird to eat at first but now I'm just used to it, it's just normal Err yeah it used to break more at the beginning cos like I think it's cos I weren't used to it I didn't have to worry about it how I ate before but like when I first got it I thought I could just eat the same things but I can't, but now I'm just used to it now and I know what I can and can't eat So the pain is the reason why they need to work it up? Yeah, cos when I first got the brace I thought I could just eat normal and then when I bit down into like toast or something it like really hurt cos it was dead sensitive if you know what I mean. But now it's fine Erm you just like kinda not think about it if you know what I mean and then you can't really feel anything until you think about it. cos the more you think about it the more you concentrate on it and then you feel like in pain more. When you don't think about it at all its just alright Yeah like I didn't really used to be bothered like I'd just eat what I wanted but like now like I'd have to think about it before I get it, like I'm still allowed to have chewies as long as they don't get stuck but like I didn't really used to care but now I have to like be proper careful that they don't get stuck on my teeth or me brace or anything just stay away from sugary drinks just make sure you focus on the sugar and how hard the food is or something, stuff like that Initial naivety of being able to eat anyting! distraction with pain to try not to think about it.	like in school if I go to get my dinner, I'll just forget about it completely and then I'll realise, Well I don't forget it's more like I just don't think about it and then I'll just remember if I don't have dance, I'll have my tea and if I have dance I'll have it after. If I do have dance I'll just have a little breakfast bar or something Yeah in dance I usually take like flavoured water or water, not like a fizzy energy drink but like a normal still energy drink. I know it's still as bad for you but like still take it - alteration with activity. Still takes energy drink but aware its bad for her appliance	You gotta like, in the food you've gotta look at the sugar and all that cos if you like if you miss the slightest part on your brace like you'll get like yellow boxes around the brace and then they won't go for ages so First of all, eat soft food cos it will hurt and then work your way up slowly but don't just go and have an apple straight away, cos like I had to have noodles for a few days or like spaghetti cos I couldn't eat, so then I'd just tell them to eat soft food and then work your way up Yeah, cos when I first got the brace I thought I could just eat normal and then when I bit down into like toast or something it like really hurt cos it was dead sensitive if you know what I mean. But now it's fine - covered in other subthemes but shows learning over time with regard to what they can eat. consideration of demineralisation and causes of this.	it's completely different when you don't have braces compared to when you do have braces, cos like I feel like I've got a bit more of a lisp than I did when I didn't have braces cos I didn't have a lisp when I didn't have braces but but now I do but it's like when you're not used to it you just feel like weird or uncomfortable but it gets alright and then its fine.. Only when you get them tightened. Well, I'd say to some of my friends and family it is different cos they can just eat like whatever they want but like I have to be more careful on what I choose or something, they can just get like whatever they want My older cousin used to have a brace so she used to just tell me you can't eat that or be careful when you eat that or something like that... No but they always like complain that they want braces and I'm like really? Cos my best friends getting braces but she's on the waiting list and she's like I can't wait and I'm like ok! - Social influence of advice from friends/family. Increased demand from pupils her friend wants one. Cant eat the same as those around her
P5 T1	Erm it doesn't really bother me it just takes more time but its fine I'll probably get used to them yeah, like more confident I haven't really changed what I eat really I don't think, like I just have the same things for tea.. I wouldn't say it's hard but sometimes you're just sometimes like 'ahhh do one' but it's fine really Just get on with it. Well I just ate the same, I just think like think about the way you eat it rather than what you eat.. yeah - Confidence, unperturbed. anger. acceptance Think about way you eat not what you eat!!	Yeah at the weekends I'd like sit down for breakfast and lunch and tea more and I probably don't snack as much as when I'm in school Do you eat less on the weekend do you think? I like snack less, a lot more, but I probably still have like bigger meals and less snacks -diff routine weekends.		So when you're eating you're taking more time, do people notice that? Like your mates or at home? No they just laugh at me sometimes but they haven't been bothered if I'm like out with my friends I'll probably eat like less healthy, I'd have more sweets and stuff, like over at my mates house do you carry them around with you? Erm not to school though I think I wouldn't use that stuff there but if it's at school I just like with water just like wash it around, and just get on with it really I wouldn't think, it isn't embarrassing but it's just my mates find it funny like yeah, its more my mates then actually having it I think I went out like a few days after for my mates birthday to a burger place and I couldn't eat so yeah. Erm they understand but they just find it funny more than anything, cos a lot of my friends have already had theirs on so they've had theirs off now - Friends are supportive and have also had braces. Many already have them removed. Negative influence of friends house were they have more sweets etc. Participant would not use interprox brushes at school! Restriction of food at social events - mates birthday
P5 T2	Ermm, I don't think it has changed at all to be honest. I still eat the same types of things in the same ways and stuff I think I've just got more confident that they probably won't break as easily as you think they will I don't really do chop things up as much but I don't know whether that's just cos I cant be bothered to or I just don't feel like I need to anymore No I don't really think much has changed so its just standard, normal, so yeah.. I was more careful with what I ate and how, but probably was healthier for them yeah in the back of my mind but like not all the time I just act like I don't have them on so I just find it easier in eating and stuff - Apathetic attitude to changes. Lost drive to alter food- diminished with time maybe dont need to?	Like I wouldn't think every day oh I've got my braces on unless I'm thinking about, like I couldn't notice I had them on if I'm just in a normal conversation or something.. -Similar to above- normalisation	So do they give you advice or have you just learnt on your own? Ermmm just learnt on my own really Yeah I just got more used to having them and how to eat with them - Learnt behaviour of how to care for appliance	the same as what my family eat cos like obviously we have the same teas and like similar dinners and stuff but different from my friend's only cos like they are vegetarian and stuff, but like nothing dramatically different embarrassing when you're eating? Ermmm only if food gets stuck in the braces but other than that no - as expected has same evening meals as family.

P6 T1	I think what will be the best and what won't hurt me	I'm a dancer so I have to eat fruit and veg, but I do obviously have treats like, but then every day I have 5 a day because otherwise I wouldn't be fit to dance -m Very concious of healthy diet with activity - dance.	Yeah they said, if you're going to have juice only have it with your meals instead of getting a slush I would get flavoured water or something. - Advice from professional remembered. However misunderstanding regarding causes of demin.	Well, my other friend got braces too so she got them before me so in school she tells me what to eat and what not to eat in school they don't really do unhealthy things so I don't have much of a choice well when I first got them on I was a bit embarrassed because everyone was saying I can see your braces Like when food gets stuck, that's quite embarrassing so I just go to the toilets and I've got a little mirror that I got in the pack.. Does anyone ever say anything about food in your brace? Only my friend who has braces, we skit each other The same as me really, we are a healthy family so after tea we would have fruit and then we could have a treat but we would have to have fruit before we had a treat. We all have a 5 a day, every day. Some of my friends say we should go and get a slush or something and im like no I can't, so instead of getting a slush I would get flavoured water or something. It's hard to not be embarrassed at first because everyone is crowding around you because its different and you look different at first but then you get used to it. - Along with a brace friend they help each other out regarding food trapping in the brace. initial embaracement with new braces. ADVICE off friends with braces. restriction of foods at school canteen- for the better with no unhealthy options? cleans in school toilets.
P6 T2	I feel like I've not been eating as much rubbish if you know what I mean, Like it was like really weird at first cos I'd normally go straight in and have something to eat but I can't really now otherwise it'll just snap straight away Ok, and does it annoy you? Are you bothered or would you just... I was but I'm not anymore Just like some things that I'm used to not eating now so I've just gone off it or it's like I can't eat it cos it's too hard or.. - rEDUCED rubbish- eating healthier, concideration before eating. No longer concerened with time.	Well in school obviously we have a set time for lunch, so breakfast I normally have at the same time and then like different days I have like, cos different days with dancing so it depends when I have my tea.. At first it was like hard to get used to it cos obviously you've got a load of metal in your mouth but I can't really remember what it was like without them now Normalisation again. doesnt even think about them being in	So when you get them changed like today and they tighten them, will it hurt again? Yeah Ok and that's no better than before? No... It's probably worse the first time cos I weren't really used to it but now I know what I have to do In case it breaks them or stains them or something Learnt what to do after adjustments to get by.	Like my best friend has braces too so we practically eat the same things What does skit mean? Like make like jokes about each other but in like obviously a nice way Have you ever been embarrassed wearing braces? At first I was like my appointment was quite early in the day so I had to go back to school and everyone was like oh my god you've got braces if I get like cos I use you I know the little interdental brushes so I use them it's embarrassing when I'm eating but I'm used to it now so I don't really realise when anything's stuck in my braces - Influence of friend- good in this case they eat the same things. Also 'Skit' each other to look out for each other. Felt embarrassment initially at school but here talks about appearance and not really with eating.
P7 T1	Is there anything you eat now or don't eat now that you feel like you want to? No not really. You don't feel restricted? No is it just the chewies? No that was just like when I used to eat quite a lot but I don't eat it now in case it obviously gets stuck and that, but its not really bothered me that much. Ok. Has that been difficult to follow? No not really no! I was dead cross with it literally, it's a nightmare to eat, you'll literally snap it. -Acceptance, doesn;t mind restictions such as chewing gum any more. early struggle.	I probably eat less at the weekend -weekend intake- reduced		All of them have had had braces already so Whenever it's on I don't want to look in the mirror - it was horrible! First time I got them on I was like oh my god what is that?! it was like a disgrace and then you get used to it. This is actually my mum's fault, in a restaurant abroad, I was eating spinach, she never told me I had spinach just in my braces, she just let me go out with it, oh my god that was it! We eat healthy and that, it's like salads, me mum likes olives and stuff like that! so we just eat that type of stuff. Ok and do you think you eat differently between your family and your friends? Between my friends yeh but not my family. We eat out a lot, at least once a week maybe, we eat out so much! - Initial embrassment at appearance of brace. embarrassment at food trapping incident on holiday. Blames mother for not telling them. Eats the same things as family as might expect but diff to friends- not elaborated.
P7 T2	I never really changed my diet due to my brace literally I haven't changed anything No I eat it, then once it's in my mouth I figure out its gonna get stuck Stick to whatever you eat and drink now, I don't yeah it literally hasn't changed me whatsoever... I think every time I've had it fitted its broke I've gotta ask questions about how you've adapted and changed to your brace but you haven't really have you? Literally none It depends if I'm eating fast or slow, my brace changes nothing I don't think - Pt says they have not changed at all and eat what they want but on further questioning they admit to many breakages!	I wouldn't even know they were in my mouth right now normalisation		I'm one of them kids like my mum literally does everything like, like literally I don't even use the kettle she does everything Every time I eat.. well, I check first to see if there's stuff in my brace and if not I just leave it but if there's stuff in it I just have to get it out cos my anxiety of it being in there and like people can see it I remember me mate was eating one in school and he had a brace and she was like no it doesn't get stuck watch and he went like that with the chewy and pulled it and it was just badly tangled up so badly Do you think the diets the same as your family or your friends? Yeah, like in the house we all eat as a family like every night I know if we do it I'll be like oh have I got something in my brace and she looks for me. I say 'have I get anything on me', and she goes 'no'. - - Also anxious about food trapping and needs to get this out! Experience of brace friends also having trapping episodes. Also eats same meals as family. Another participant whos friends help to identify food trapping - mutually supportive
P8 T1	Then I got used to it I would say that It wouldn't really hurt	Do you still eat the same times? Yeah I eat the same times		What about at school, do you eat the same food as your friends or? Not really because they eat stuff that I'm not allowed to eat so I just get what I can How is it different to your friends? Cos I can't eat hard food and they can, they don't have braces

P8 T2	I don't really think about my braces I just don't like think about it I just eat normally - Again participant doesn't think about their appliance. Good that they have adapted well but bad that they are not considering the appliance and possible breakages.			So compared to your friends and family, its softer? Yeah I eat softer So when they order food do you have the same thing they order or? Sometimes when it's soft I think you were saying last time you've only got one friend with braces This time there's a lot of people cos I'm in 2nd year now, I have a lot of people who have braces
P9 T1	it was a bit difficult at first like, I have gone back to eating them now but it's just a bit difficult and it's like quite annoying because it gets stuck and brown stuff in my mouth as well like, I have gone back now how do you feel about the changes? Not too bothered like, it's not too much to think about coz I really don't eat much like chewy sweets anyway and I just have apples afterwards, I don't mind that much!! I try to think, I do think about my braces if someone like gave me like something to eat, like that's a bit hard, I would just like cut it up or like, I'd only not eat something if it was like really going to break them or like, like apples and that, it's like just a few things, like otherwise I just try and cut them up or break them off instead like to try and eat them! Erm not really no, I think I was thinking it about myself like coz I don't really, I want my teeth to be like nice afterwards so I try and like follow it, think before I eat anything that would break them or is bad for my teeth but erm sometimes like I drink a bit too many sugary drinks! But like, you now like, I do like juice and that probably a bit too much and squash but.. - acceptance now getting on wit it and unperturbed. Consideration over what to eat and responsibility for treatment because of desire for final aesthetic result.	The sugary drinks they said don't drink, just drink water, milk and that in between and then, it's hard trying to remember! Yeh I eat my breakfast earlier so I have time to brush them properly afterwards. - - considers brushing around eating. Still aware of ortho advice but finds it hard to remember	when I first get them off like jut for relief but, it's probably better for my teeth with the drinks and that, I'll probably not try and drink as many, as much, any more coz it's better for your teeth. - Learnt the harm that comes from acidic drinks.	What do your friends think? They've all got braces. Have they? Yeh, literally all of them so, we all talk about it. it's just uncomfortable people watching me sometimes chewing! Has anything ever been embarrassing? Er I did get something stuck like right here, it just wouldn't come out, it was really getting stuck and chewing with my mouth open a bit like, it' hs hard to keep it shut when I chew but I don't really mind! Do you eat in front of your friends and..? Yeh and they all like understand coz they are all the same! They've got braces but they are a bit more, they are not as careful as me coz they have had them for longer. So they give you advice and things? Yeh they all like, no not really, they just tell me to eat everything coz like that's fine it won't break but theirs always breaks! No like I just eat the same, probably eat a bit more hard food like with my mum like coz I don't really care but, they just all like, tell me to eat it coz my friends like it oh it won't break like, and go for my chewies and fine!
P9 T2	Fine, just completely normal yeah it's just really easy just the same as before really yeah I don't know, I've not had any changes I don't think, or had to change much of anything A little bit, I'm probably more conscious about what's bad for my teeth and like I just wanna keep a bit healthier cos then it's better for the braces I guess Err I've always been more teeth, in like healthy teeth conscious so I'll probably try and take care of them normally I'd just think is this healthy for me not like my teeth but now I think of my teeth probably more than me but hopefully it's still healthy for me as well I don't really like smiling with them but I'm not bothered they're just fine I think I was like less confident of biting but now it's like I know they're probably not gonna break so im just like biting normally.. just eat normally cos it's not gonna make that much of a difference its quite normal for me and it's just like the same everything for me, I don't really have to change anything or... I think I've just like had to get on with it when it hurts it doesn't hurt ever really anyway, it's just normal now, there's not really much to cope with its just there, you can't notice it at all, well I can't notice it I don't know how other people are but I don't notice anything really I'm just looking at what I want, there's nothing that I don't, most of the time or all the time really there's nothing I think I can't eat so... Avoid sugary drinks and fizzy drinks and just be careful when biting into hard stuff, I'm not sure why but yeah, just be careful cos I think it can break it sometimes but mine don't feel like they're gonna break so that's ok, except for the one time -Normalisation. Pt more confident with bite now. Just gets on with it and feel like normal now. Not much of a difference. conscious about whats bad for teet. Over time 'nothing that cant eat'!	No just the same yeah, just like 3 main meals and snacks a bit in between at school at break and that It's just there yeah, you don't like think I've got a brace on its just like your teeth it doesn't feel like it's there really most of the time it's just the same I don't really think about the braces that much. Has it been any different this week? No just yeah I've had more time in the mornings like and probably brush my teeth better cos I am quite rushed in the mornings so I probably don't brush them as long as I probably should What about like diet wise like on a weekend or on a week off, is that any different? Probably a lot unhealthier, probably more like treats and that when we go out places but not that bad, I don't think How did you even eat it? I don't know it just felt like normal, it was ok like, I had lots of pieces of corn in my teeth so yeah I probably shouldn't have that again - - Normality again. Worse at weekend- more treates.eats out. I haven't really noticed it changing but it obviously has	it feels at first like there's lots of things in your mouth, there's lots of wires so you don't wanna bite down on them cos you're scared you'll like break them or something but now I know that I won't break them - Initially carefull and build up confidence.	Are your friends the same? Err some of them, some of them are a bit 'don't care' and just eat like chewy all the time, that's just what they're like, some of them don't drink like fizzy drinks and stuff and are like oh I shouldn't drink that it'll be bad for my teeth but some of them are just a bit... sometimes I bring an interdental brush just to clean them out a bit cos it's a bit disgusting if there's stuff stuck in them.. No, just sometimes cos most of the time it doesn't get stuck and all my friends have them as well so everyone's like you've got a bit in your braces So do you notice your mates have got stuff stuck or? No, if they've got something noticeable I'd be like err you've got something stuck but not really like, everything just looks the same its fine How do you feel about eating now? ALL AS PREVIOUS No different really, just probably a bit conscious if there's something stuck like after I've eaten but eating, hopefully I eat the same and I don't eat weird but I'm just fine yeah Yeah, I eat all the same as them, I mean it's a bit healthier than some of my friends cos like I eat quite healthy and like my mum makes us eat healthy but like I eat the same as all my family, I didn't at first I ate like mashed potato for the first like 2 days but now it's just the exact same I don't really change anything

Appendix 7 – Overview- Attribute levels of the traffic light signposting scheme

	Low Level	Medium Level	High Level
Fat (g/100 g or 100 ml)	2.8	9.6	32.1
Saturated fat (g/100 g or 100 ml)	0.9	2.5	8.5
Sugar (g/100 g or 100 ml)	1.8	9.0	32.6
Sodium (g/100 g or 100 ml)	0.1	1.3	2.7
Calories kJ/100 g or 100 ml kcal/100 g or 100 ml	 109 26	 686 164	 1602 383

(Food Standards Agency, Hieke and Wilczynski, 2012 [103]

Appendix 8 – Data caption scheme guidance

COLUMN A: Channel	Channel name and number (e.g. ITV, C4, E4)
COLUMN B: Date	Format DD/MM/YY
COLUMN C: Day	Day of the week
COLUMN D: Programme name	Programme in which the advertisement is shown (or programme the advertisement is before)

COLUMN E: Programme category

Code as below:

1 = Comedy
2 = Drama
3 = Movie
4 = Soap opera
5 = Music/music video
6 = News/commentary
7 = Talk shows
8 = Reality
9 = Sports
10 = Entertainment/variety
11 = Documentary
12 = Game
13 = Children's
14 = Infomercial
15 = Other

COLUMN F: Advert product type

1 = Food and drink
2 = Clothes/shoes
3 = Education
4 = Entertainment (including music, video, films, entertainment parks)
5 = Financial (including building societies, banks, insurance, pensions)
6 = Household cleaners/detergents (including washing up liquid, washing powders, cleaning fluids)
7 = Household equipment (including electrical appliances)
8 = Motoring (including cars and petrol)
9 = Pet products (including pet food)
10 = Pharmaceutical (including medications, vitamin pills, breath fresheners)
11 = Public information announcements/community service announcements (general)
12 = Public information announcements (sponsored by food companies)
13 = Publishing (including magazines, books, newspapers. Includes recipe books and cooking magazines)
14 = Retailing & mail order (including catalogues, other that supermarkets)
15 =Toiletries (including soap, hair shampoo, cosmetics, nappies, sanitary protection)

16 = Toys
17 = Travel/transport/holidays
18 = Utilities (including telephone, gas, electricity)
19 = Channel promotions (including promotions for the channel, other programs)
20 = Other
21= dental health care products

The following additional details of all *FOOD* advertisements are to be coded:

COLUMN G: Food product brand name
Manufacturer's name and brand name of product (e.g. McDonald's Big Mac or Cadbury's Fruit & Nut Chocolate).

COLUMN H: Detailed description of food product
The description of the product should be thorough. The product needs to be identifiable for the purposes of collecting nutrition information. Include flavor or brand variant (E.g. "chocolate coated, cream-filled biscuit" rather than just "biscuit").

COLUMN I: Food code
If more than one food product is shown in an advertisement, select the one that is the most dominant. If equal attention is given to different products, select the product that is shown first.

Core and healthy food categories
1 = Breads (include high fibre, low fat crackers), rice, pasta and noodles
2 = Low sugar and high fibre breakfast cereals (<20g/100g sugar *and* >5g/100g dietary fibre)
3 = Fruits and fruit products without added sugar
4 = Vegetables and vegetable products without added sugar
5 = Low fat/reduced fat milk, yoghurt, custard (<3g/100g fat) and cheese (<15g/100g fat; includes 50% reduced fat cheddar, ricotta and cottage) and their alternatives (E.g. soy) (including probiotic drinks)
6 = Meat and meat alternatives (not crumbed or battered) (includes fish, legumes, eggs and nuts and nut products, including peanut butter and excluding sugar coated or salted nuts)
7 = Core foods combined (including frozen meals (<10g/serve fat), soups (<2g/100g fat, excludes dehydrated), sandwiches, mixed salads and low fat savory sauces (<10g/100g fat; includes pasta simmer sauces)
8 = Baby foods (excluding milk formulae)
9 = Bottled water (including mineral and soda water)

Non-core and unhealthy food categories
10 = High sugar and/or low fibre breakfast cereals (>20g/100g *or* <5g/100g dietary fibre)
11 = Crumbed or battered meat and meat alternatives (e.g. fish fingers) and high fat frozen meals (>10g/serve fat)
12 = Cakes, muffins, sweet biscuits, high fat savory biscuits, pies and pastries
13 = Snack foods, including chips, savory crisps, extruded snacks, popcorn, snack bars, muesli bars, sugar sweetened fruit and vegetable products (such as jelly fruit cups, fruit straps) and sugar coated nuts.
14 = Fruit juice and fruit drinks
15 = Frozen/fried potato products (excluding packet crisps)

16 = Full cream milk, yoghurt, custard, dairy desserts (>3g/100g fat) and cheese (25% reduced fat and full fat varieties, and high salt cheese, including haloumi and feta) and their alternatives
17 = Ice cream and iced confection
18 = Chocolate and confectionery (including regular and sugar-free chewing gum and sugar)
19 = Fast food restaurants/meals (include general pizza, burgers, and 'healthy' alternatives from fast food restaurants)
20 = High fat/sugar/salt spreads (includes yeast extracts, excludes peanut butter), oils, high fat savory sauces (>10g/100 fat), meal helpers (including stocks, tomato paste) and soups (>2g/100g fat tinned and all dehydrated)
21 = Sugar sweetened drinks including soft drinks, cordials, electrolyte drinks and flavour additions e.g. Milo).
22 = Alcohol

Miscellaneous
23 = Vitamin and mineral supplements and sweeteners
24 = Tea and coffee
25 = Supermarkets – advertising mostly non-core foods
26 = Supermarkets – advertising mostly core foods
27 = Supermarkets – non-specified (generic supermarket ads or not clearly for core or non-core)
28 = Baby and toddler milk formulae.
(Note: Many fast food restaurants sell 'healthier' products. These items should still be classified as unhealthy, as it is essentially the brand name that they are promoting, not the product. Consumers continue to purchase unhealthy foods from these venues, and the provision of healthy alternatives merely acts to give the brand a positive image.)
29 = Home food delivery services

COLUMN J: Health claims
Verbal or textual. Where more than one claim is made, use main claim. If more than one main claim, use first mentioned health claim.
1 = Low fat/fat free
2 = sugar free
3 = No added sugar/less sugar
4 = Low calorie/light
5 = Low carbohydrate
6 = Organic
7 = Natural ingredients/all natural/no preservatives/nothing artificial
8 = Provides essential nutrients (inc. protein, calcium, potassium, vitamins, antioxidants)
9 = Whole grain/whole wheat
10 = Fibre or bran
11 = Heart healthy
12 = Low cholesterol
13 = Diet
14 = Baked
15 = Five a day

COLUMN K: Primary target
Intended target audience (determine using age of actors, network and nature of persuasive appeal).

1 = Children
2 = Teens
3 = Adults (20-64 years)
4 = Older adults (65+yrs)
5 = All ages

COLUMN L: Cariogenic food
0 = low level of sugar containing diet (0.1 - 1.8 g/100 g or 100 ml)
1 = medium level of sugar containing diet (1.9-9.0 g/100 g or 100 ml)
2 = high level of sugar containing diet (9.1-32.5 g/100g or 100ml)
3 = very high sugar containing diet (≥32.6 g/100 g or 100 ml) – liquid
4 = very high sugar containing diet (≥32.6 g/100 g or 100 ml) - slowly dissolving foods
5 = very high sugar containing diet (≥32.6 g/100 g or 100 ml - solid foods
6 = very high sugar containing diet (≥32.6 g/100 g or 100 ml - sticky foods
7 = Non-specified foods
8 = Supermarkets – non-food products
9 = Supermarkets – dental healthcare products
10 = zero

COLUMN M: Common acidogenic food
0 = None erosive diet
1= Soft drinks — carbonated and diluted squashes (including the 'diet' varieties and sports drinks)
2 = Fresh fruit juices and fruit juice drinks
3 = Fruit and acidic sweets (e.g. acidic fruit drops)
4 = Non-specified foods
5 = Supermarkets – non-food products
6 = Supermarkets – dental healthcare products

COLUMN N: Common food with possible anticariogenic and/or anti erosive effect
0 = None
1= milk
2 = cheese
3 = peanuts
4 = sugar-free chewing gum
5 = xylitol sweeteners, gum
6 = tea (unsweetened)
7 = Sunny D Calcium
8 = Non-specified foods
9 = Supermarkets – non-food products
10 = Supermarkets – dental healthcare products

COLUMN O: Mechanical detriment to orthodontic appliance

If food item has two or more of the following properties, record the most detrimental to appliance.

0= No mechanical detriment

1 = Hard food
2 = Sticky
3 = Chewy
4 = Crunchy
5 = Non-specific foods

COLUMN P: Hardness of food

1 = Soft
2 = Medium
3 = Hard
4 = Very hard
5 = non-specific foods

Appendix 9 – Example data caption scheme for coding TV advertisements

Channel	Date	Day	Program name	Program category	Advertised product type	Food product brand name	Food product DETAILED description	Food code	Health Claims	Primary Target	Cariogenic food	Common acidogenic food	Common food with possible anticariogenic &/or anti-erosive effect	Mechanical detriment to orthodontic appliance	Hardness of food
ITV	05/01/08	Saturday	Toonattik	13	19										
ITV	05/01/08	Saturday	Toonattik	13	7										
ITV	05/01/08	Saturday	Toonattik	13	6										
ITV	05/01/08	Saturday	Toonattik	13	1	McDonalds Happy Meal	Depicted as hamburger, bottled water and fruit bag but primarily sold as hamburger, fries and soft drink	19	15	1					
ITV	05/01/08	Saturday	Toonattik	13	15										
ITV	05/01/08	Saturday	Toonattik	13	16										
ITV	05/01/08	Saturday	Toonattik	13	15										
ITV	05/01/08	Saturday	Toonattik	13	6										
ITV	05/01/08	Saturday	Toonattik	13	15										

Appendix 10 – Literature review search criteria

All references were organised with Mendeley® (Elsevier, Amsterdam, Netherlands).

Part A

Ovid (MEDLINE)-

Database: Ovid MEDLINE(R) 1946 to Present with Daily Update
Search Strategy:
---
1 orthodontics/ or exp orthodontic appliances/ (29046)
2 adolescent/ or child/ (2616927)
3 beverages/ or exp food/ or exp diet/ or exp eating/ or exp feeding behavior/ (1440535)
4 Energy Intake/ or intake.mp. (227461)
5 3 or 4 (1524529)
6 1 and 2 and 5 **(472)**

Returned N= 472. After review/ duplicate removal N= 47

Also searched:

Database: Ovid MEDLINE(R) 1946 to Present with Daily Update
Search Strategy:
---
1 orthodontics/ or exp orthodontic appliances/ (29046)
2 adolescent/ or child/ (2616927)
3 beverages/ or exp food/ or exp diet/ or exp eating/ or exp feeding behavior/ (1440535)
4 Energy Intake/ or intake.mp. (227461)
5 3 or 4 (1524529)
6 1 and 2 and 5 (472)
7 qualitative research/ (35346)
8 interview/ or personal narratives/ (30451)
9 focus groups/ or interviews as topic/ (73813)
10 7 or 8 or 9 (127059)
11 6 and 10 **(3)**

N = 3, after review/ duplicate removal N =2, which were the 2 key articles.

The key articles were also searched with the Ovid tool: 'Find similar'- N=2, after reivew N=1.

Scopus-

((TITLE-ABS-KEY (fixed W/2 appliance*)) OR (TITLE-ABS-KEY (brace*)) OR (TITLE-ABS-KEY (orthodontic W/2 bracket)) OR (TITLE-ABS-KEY ("fixed orthodontic"))) AND ((TITLE-ABS-KEY (diet*)) OR (TITLE-ABS-KEY (eat*)) OR (TITLE-ABS-KEY ("energy intake")) OR (TITLE-ABS-KEY (food*)) OR (TITLE-ABS-KEY (beverage*)) OR (TITLE-ABS-KEY (masticat*)) OR (TITLE-ABS-KEY ("eating behaviour"))) AND ((TITLE-ABS-KEY (child*)) OR (TITLE-ABS-KEY (adolescent*)) OR (TITLE-ABS-KEY (young W/3 adult)) OR (TITLE-ABS-KEY (pediatric OR paediatric))) AND (LIMIT-TO (LANGUAGE , "English "))

Returned N= 169. After review/ duplicate removal N= 48

PsycINFO –

(fixed n2 appliance* OR brace* OR orthodontic n2 bracket OR "fixed orthodontic") AND (diet* OR eat* OR "energy intake" OR food* OR beverage OR masticat*) AND (child* OR adolescent* OR young n3 adult)

N = 11, after review/ duplicate removal N = 2

CINAHL Plus –

(fixed n2 appliance* OR brace* OR orthodontic n2 bracket OR "fixed orthodontic") AND (diet* OR eat* OR "energy intake" OR food* OR beverage OR masticat*) AND (child* OR adolescent* OR young n3 adult)

N= 25, after review/ duplicate removal N = 9

Key articles reference search-

Articles cited in 2 key references searched:

- Carter LA, Geldenhuys M, Moynihan PJ, Slater DR, Exley CE, Rolland SL. The impact of orthodontic appliances on eathing – young people's views and experiences. Journal of Orthodontics. 2015, 42 (2): 114-22. N= 22, after review N = 20.
- Jawad FA Al, Cunningham SJ, Croft N, Johal A. A qualitative study of the early effects of fixed orthodontic treatment on dietary intake and behaviour in adolescent patients. Eur J Orthod. 2012;34(4):432–6. N = 21, after review N = 21

PART A TOTAL WITH DUPLICATES REMOVED- N = 108

Part B

Ovid (MEDLINE)-

Database: Ovid MEDLINE(R) 1946 to Present with Daily Update
Search Strategy:
---
1 exp Television/ or Advertising as Topic/ (44263)
2 beverages/ or food/ or diet/ or energy intake/ or eating/ or feeding behavior/ (300564)
3 (orthodont* or dentist* or dental*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (471000)
4 1 and 2 and 3 (30)

****

Returned N= 30. After review/ duplicate removal N= 16

Scopus-

(TITLE-ABS-KEY (*television** OR *advert**)) AND (TITLE-ABS-KEY (*beverage** OR *food** OR *diet** OR *"energy intake"* OR *eat** OR *"feeding behaviour"*)) AND (TITLE-ABS-KEY (*orthodont** OR *dentist** OR *dental**))

Returned N= 126. After review/ duplicate removal N= 26

PsycINFO –

(television* OR advert*) AND (beverage* OR food* OR diet* OR "energy intake" OR eat* OR "feeding behaviour") AND (orthodont* OR dentist* OR dental*)

N = 11, after review/ duplicate removal N = 1

CINAHL Plus –

(television* OR advert*) AND (beverage* OR food* OR diet* OR "energy intake" OR eat* OR "feeding behaviour") AND (orthodont* OR dentist* OR dental*)

N= 34, after review/ duplicate removal N = 14

PART B TOTAL WITH DUPLICATES REMOVED- N = 33